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Charles A. Ellwood and Howard E. Jensen

Consulting Editors

CREATIVE FACTORS IN SCIENTIFIC RESEARCH

Creative Factors in Scientific Research

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A SOCIAL PSYCHOLOGY OF SCIENTIFIC KNOWLEDGE

STUDYING THE INTERPLAY OF

PSYCHOLOGICAL AND CULTURAL FACTORS IN SCIENCE

WITH EMPHASIS UPON

IMAGINATION

BY

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To Ella,
Frances, Eltinge, and Rosella

EDITORIAL NOTE

NOTWITHSTANDING the increasing emphasis upon research in American sociology during the past quarter of a century, the methodology of the subject remains in a backward and chaotic state. Sociologists have indeed done some excellent work in elaborating the *techniques* of research in connection with their factual investigations of various types of social phenomena. In their surveys, their case studies, their statistical and ecological analyses, they have exercised much ingenuity in devising technical procedures for manipulating the phenomena under investigation, for defining their variables with greater precision, and for determining the conditions under which they occur, so as to yield more accurate observations and a more dependable accumulation of social data. But little attention has been paid to methodology in the historical sense of the term as a critical inquiry into the basic assumptions of a science concerning the nature of the phenomena investigated and the logical methods of reasoning about them and of drawing inferences from the conditions under which they occur so as to interpret them as accurately as possible. Consequently, most of the handbooks on methods of social research are manuals on fact-finding rather than treatises on methodological exploration. They either implicitly ignore or explicitly repudiate methodological problems in their historical sense, and confuse the term "methodology" with the purely technical or technological aspects of scientific investigation.

But such conceptions of scientific method are wholly inadequate. As the author of this volume demonstrates, they ignore the dynamic aspects of research. They may enable us to arrive at superficial knowledge, but never to attain penetrating understanding. It is true that a science remains highly speculative and conjectural until it has developed suitable technical methods, but technical methods are auxiliary to logical methods, and the methodological principles of a science are generative of its technological procedures.

The dynamic factor in research consists in the creative insights of the scientific imagination working under the control of observation, experimentation, and reasoning. For not only does man's social life as we know it consist in culturally derived forms and processes of human asso-

ciation, but culture is itself the product of creative insight, and requires the same mental processes for its study and interpretation as were originally required for its origination and development. And no deterministic theories of man or society which deny the emergence of genuine novelty in the latter through the capacity for creative mental synthesis of the former can provide an adequate methodological basis for social research. Nor can methods limited to the fact-finding study of social interactions constitute such a methodology.

It is the merit of Dr. Porterfield's work that he does full justice to these facts of novelty and creativity in both the development and interpretation of culture, and that he turns aside from the secondary problems of research techniques to the development of the sociological methodology which this recognition implies.

HOWARD E. JENSEN and
CHARLES A. ELLWOOD, *Duke University.*

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I am also grateful for permission to quote often from articles in the *American Journal of Sociology, Social Forces, Sociology* and *Social Research, Publications of the American Sociological Society,* and once each from the *Psychological Review, Magazine Digest,* and *Harper's Monthly Magazine.*

Of course, I feel highly honored to have *Creative Factors in Scientific Research* included as the third number in the Duke University Press Sociological Series, following Joseph Mayer's brilliant and definitive *Social Science Principles in the Light of Scientific Method.* I hope that my work may, in a measure, be a complement to that volume.

AUSTIN L. PORTERFIELD

September 10, 1941

PART I

ERRATA

Page 6, line 29: *for* Section V of Chapter I *read* Section VI of Chapter II

22, note 46: *for* Cambridge *read* New York
for 210 *read* 289

26, line 27: *for* impossible *read* possible

51, note 30: *for* 1903 *read* 1930

58, line 26: *for* from from *read* free from

64, line 22: *for* PHRASES *read* PHASES

126, note 46: *for* "Sociology Sampling" *read* "Sociology and Sampling"

187, note 64: *for* 1928 *read* 1922

244, note 7: *for* 1939 *read* announced for 1942

251, note 31: for *Failure or Success* read *Success or Failure*

261, line 16: *for* a real *read* areal

274, line 411: *for* Sydenthicker *read* Sydenstricker

CONTENTS

CREATIVE FACTORS IN SCIENTIFIC RESEARCH

CHAPTER I

INTRODUCTION: PROBLEM AND PERSPECTIVE

"But as life and mind grew more ambitious and adventurous, situations arose when even Mind was puzzled. Then there was a check in the proceedings, some moments of

PAIN

the glow turned into incandescence, Mind was

THINKING

"Things were never the same after this . . . there was no forgetting that thinking experience. It was not all comfortable—at least not at first—but there was a fascination about it that Mind could not resist. It was now definitely interested in itself.

"In moments of self adoration, it would forget Nature, Life, the world outside, spell-bound by the inner view. . . . Then visions would come to mind, phantoms. Some like things outside, and others quite different. Some of these Mind kept to itself, but others it thrust out into the world and made them live . . . Thought and

IMAGINATION

were transforming the world, and the thinker and dreamer was

MAN"

—Alexander Goldenweiser

WHEN William Fielding Ogburn made his presidential address before the American Sociological Society in midwinter of 1929, his subject was "The Folkways of a Scientific Sociology." In the course of this address he made a remarkable prediction concerning the future trends of the sociological tradition and put the full weight of his own support behind the development of these future folkways. As he outlined these trends, in part, he said:

In the future era of scientific sociology there will be a marked decline in the prestige of intellectuality as such as compared with its vogue in the nineteenth and twentieth centuries. But this decline in the prestige of intellectuality will be only among the scientists themselves. For the difference between scientific activities and intellectual activities will be more sharply drawn. . . . This does not mean, of course, that scientists may not be great intellects. Quite the contrary. Intellectual play or display may be the recreation of the future social scientist but hardly his main work. . . . Of course the disciplining of thought is not so apparent in one of the steps in scientific work, viz., the originating of ideas, or in the slang equivalent, "the getting of hunches." There imagination and free association are the greatest aid to the scientist. It is for this reason that

one says, and quite truly but rather crudely, that there is something of the artist in every scientist. So intellectualism is the proper atmosphere for the birth of ideas.[1]

There were many, however, who, though fully recognizing the indispensability of statistics and research in the social sciences, believed the statement to be rather extreme; who have been inclined to emphasize the role of creative thought in sociology and in all other social sciences as the serious business of the scientist, not as "play or display." They have been able to see no good accruing to science through minimizing the "proper atmosphere for the birth of ideas," and have been doubtful that American sociologists should adopt such folkways.[2] Of course, Ogburn's theories of *social change* and *culture lag* by no means suggest that he lives in a purely quantitative atmosphere in the realm of his actual scientific practice; but his emphasis upon the necessity for his hearers to move in that direction brought the struggle between factions in the American Sociological Society more boldly than ever into the open.

In the midst of the struggle generated among American sociologists by uncertainty as to method, this study of the factor of controlled imagination in scientific investigation began, and continues. It began with the question suggested by Ogburn's address, What is the function of imagination (not of free association) in social research? It continues by applying the same question to other fields. For study of this problem brings an increasing awareness of the significance of creative insights in all scientific endeavor; yet the student, in pursuit of the problem, also becomes more awake to the interactive force of other factors in the development of science and of scientific method; particularly of another factor suggested by the key word in the title of Ogburn's address: the *folkways,* broadly defined here as including the mores, the traditions, customs, culture. Hence, the problem expands itself to take in the factor of culture in the development of science and in the behavior of individual

[1] W. F. Ogburn, "The Folkways of a Scientific Sociology," *Publications of the American Sociological Society,* XXIV (1930), 3-4.

[2] C. A. Ellwood, *Methods in Sociology,* with an introduction by Howard E. Jensen (Durham, 1933), chap. v and p. 76; cf. P. A. Sorokin, "Recent Social Trends, a Criticism," *Journal of Political Economy,* XLI (1933), 194-210, and Ogburn's reply to Sorokin, *ibid.,* pp. 210-221; cf. Malcolm C. Rorty, Presidential Address to the American Statistical Association, *Journal of the American Statistical Association,* XXVI (1931), 1-10; and Howard Becker, *Systematic Sociology, on the Basis of the Beziehungslehre and Gebildelehre (by Leopold von Wiese)* (New York, 1932), pp. 51, 500.

scientists. Then, the study of Gestalt psychology gives new and fuller meaning to the well-known statement of W. I. Thomas that "the cause of a social or individual phenomenon is never another social or individual phenomenon."[3] As a matter of fact, the singular, *phenomenon,* becomes the plural, *phenomena,* for both individual and social factors (no doubt it also was for Thomas in our present sense of the term); for all behavior, whether in scientific research or courtship, is the resultant of the interactive force of many factors.

The scientist, thus, like everybody else, behaves in total situations of which he is himself an integral part; and the "field forces" operating in and through him—the motives that drive him, the stimuli that attract him, the barriers that frustrate or stimulate and challenge him, and the creative intelligence which achieves for and directs him—are also a part of that total situation, working not as separate but as interdependent factors.

As this situational view of scientific endeavor emerges, it becomes evident that the total situations of which the scientist finds himself an integral part do not evolve in a vacuum; that the scientific investigator, just as truly as the juvenile delinquent of whom we write so many life-histories, "must be viewed as a specimen in a cultural series";[4] that is, as one of a generation born into a culture-group, absorbing its folkways, its traditions; being molded by the tradition; and, in turn, modifying it, if ever so little, as John Dollard says, "as a link in a chain of social transmission." "There were links before him from which he acquired his present culture; other links will follow him to which he will pass on the current of tradition."[5]

This current of tradition, this environment into which he is born, thus has a character "that is not a mere accidental aggregate of persons and things, but . . . it is an ordered, configurated set of conditions into which the new member of the group comes."[6] As such it has its own "life-history" as well as its present configuration, system, or organization. It is a total groupal-situation with a past through which it has come and a future into which it is evolving. The individual scientist imaginatively

[3] W. I. Thomas and Florian Znaniecki, *The Polish Peasant in Europe and America* (2 vols.; New York, 1927), I, 44.

[4] John Dollard, *Criteria for the Life History* (New Haven, 1935), p. 13.

[5] *Ibid.,* p. 15. [6] *Ibid.,* p. 14.

participates in the history of this past, works in the present situation, with all its problems, and anticipates some aspect of the evolving future in his attempts at discovery. He lives not only in the dimension of social space as a possessor of a certain status, which may vitiate his scientific conclusions, and the performer of a given function; as a person with certain likes and dislikes, attitudes and values. He lives in the dimension of social time, with the past flowing through him into tomorrow. There is no other channel through which the past can flow.

In this process, the individual's life is organized, as Kurt Lewin says, "structuralized,"[7] by the patterns that come to him in the tradition, by the present social situations in which he moves, and by the search for "tolerable certainties" in the future. What the nature of his contribution, if any, will be, and the significance of it, will depend upon his total life-situation as it evolves in the total groupal-situation as *it* evolves. But the total groupal-situations of tomorrow will not, cannot proceed without the contributions of the individuals of the past, each one as at least a link in accurate, or inaccurate, transmission; and the individual scientist cannot make even so much as the contribution of accurate transmission without the creative activity of his own intelligence. Thus, from mere accurate transmission of the tradition on up to discoveries of enough importance to change the trend of centuries, creative individual intelligence, with dynamic insight, working always in interaction with other factors in a configuration, has made its contributions to the development of science and culture.

In the light of these concepts, the problem becomes one of moving toward a better grasp of the psychological, sociopsychological, and cultural factors that have interacted in the development of all science and scientific method. For a summation of these factors an appeal may be made to Section V of Chapter I, but for a more concrete presentation of them, attention is directed to all chapters in this study of *Creative Factors in Scientific Research,* in which the emphasis falls upon scientific imagination. This is our problem—and the perspective in which to view it.

The problem in this perspective calls for the study in Part I of the cultural factors in science; in Part II, the psychological factors; in Part III, the interplay of psychological and cultural factors in the lives of some

[7] Kurt Lewin, "Field Theory and Experimental Social Psychology," *American Journal of Sociology,* XLIV (1939), 878.

creative leaders in science; and in Part IV, the implications for social control of some creative factors and trends in the study of personality and society.

Finally, if an attempt to indicate the function of scientific imagination should result in failure, that failure would be only another demonstration of the importance of—imagination.

PART I

CULTURAL FACTORS IN SCIENCE

CHAPTER II

THE EMERGENCE OF SCIENCE IN THE SOCIAL PROCESS

"It is sometimes contended, for example, that since experience is a late comer in the history of our solar system and planet, and since these occupy a trivial place in the wide area of celestial space, experience is at most a slight and insignificant incident in nature. No one with an honest respect for scientific conclusions can deny that experience is something that occurs only under highly specialized conditions, such as are found in a highly organized creature which in turn requires a specialized environment. There is no evidence that experience occurs everywhere and everywhen. But candid regard for scientific inquiry also compels the recognition that when experience does occur, no matter at what limited portion of time and space, it enters into possession of some portion of nature and in such manner as to render other of its precincts accessible."—John Dewey

I. INTRODUCTORY

THIS CHAPTER on *science in the social process* will attempt: (1) to give a preliminary definition of science in anticipation of later refinement, (2) to analyze the social process, (3) to show how the social process emerged, (4) to indicate how it goes forward, and (5) to summarize the forces operative in the emergence and development of science within the social process.

II. A PRELIMINARY DEFINITION OF SCIENCE

Science, in the broadest sense, is the entire body of the most accurately tested, critically established, systematized knowledge available about that part of the universe which has come under human observation. For the most part this knowledge concerns the forces impinging upon human beings in the serious business of living and thus affecting man's adjustment to and of the physical and the social world. The scientist seeks understanding of these forces in order to exercise control over them. Pure science is more interested in understanding, and applied science is more interested in control; but this difference does not imply a radical dichotomy between pure and applied science. The pursuit of pure science must affect the adjustment of at least one person—the investigator in search of understanding; and the greater the number of persons whose adjustive

behavior it may ultimately facilitate,[1] the more significant it is, but its applicability makes it nonetheless pure science.

The first form of science was not science pursued for its own sake. It was knowledge arrived at by common sense and practice in situations that demanded action to escape extinction.[2] Scientific research carried on purely for the sake of understanding some aspect of nature may have been a late arrival in the social process; and scientific method, that is, the controlled direction of scientific research toward the solution of set problems by any process akin to present-day methods, was necessarily so. This fact can be understood, however, only through understanding the social process, how it emerged, and the manner in which it goes forward.

III. THE SOCIAL PROCESS ANALYZED

The social process has three main aspects: (1) social interaction, or present social behavior in the form of the interstimulation and response going on between individuals and groups; (2) contemporary change, consisting mainly in or resulting from inventions, contingencies, population movements, economic fluctuations, and attitudinal trends; and (3) long-run changes in patterns of culture in which one form of marriage or the family, one system of government or law, one type of religion or morality largely succeeds another; in which the old forms of industry are succeeded by new forms, as happened during the last two centuries; or one general concept of reality succeeds another; or the world of yesterday becomes the world of today.[3]

IV. HOW THE SOCIAL PROCESS EMERGED

The first aspect of the social process, that of interaction and communication, takes place on distinctive levels of behavior in different orders of life. It hardly exists among unisexual animals. Among the simplest bisexuals, however, there is a positive basis for social relations, which grow more differentiated and complex with the ascending species as the structure or original equipment of the species provides for and determines such complexity. This differentiation or division of labor, even in ants and bees, appears to rest almost solely on a biological foundation; yet,

[1] To say that science is destroying civilization does not make sense. If modern civilization goes down, it will not be science but the lack of science which will destroy it.

[2] William Graham Sumner, *Folkways* (Boston, 1906), pp. 2-3.

[3] Cf. Lowell J. Carr, "Disaster and the Sequence-Pattern Concept of Social Change," *American Journal of Sociology*, XXXVIII (1932), 207-218.

since the group behavior of ants and bees is so manifestly social, the level on which their interaction takes place may be called biosocial.

The entomologist W. M. Wheeler has been so impressed by the intricate organization of the social insects that he believes it "difficult to detect really fundamental differences" between "human and insect societies."[4] But C. J. Warden replies that, "as a matter of fact, the differences are so fundamental that the similarities appear altogether trivial and superficial"; that insect societies are "phylogenetic and hence based upon hereditary mechanisms," while human societies are "ontogenetic and directly dependent upon invention, communication, and social habituation."[5] Wheeler's claim for the similarities of human and insect societies does not seem consistent with his hypothesis that the social organization of some insects has not changed appreciably in fifty-five million years; that is, since the beginning of the Tertiary age.[6]

This apparent changelessness is the result of the much more nearly exclusive hereditary nature and the greater structural limitations of the social behavior patterns existing at the biosocial level. A new series of mutations, however, was preparing the way for the emergence of a culture-building animal, with physical, mental, and social advantages that lifted his behavior to the sociocultural level, and made social evolution independent of biological evolution, the process in which it began.[7]

This series of mutations, the order and the nature of which remain matters of much speculation, was providing for man the physical advantages of an erect attitude, free hands, opposable thumbs, a head well balanced on the axis of the body as a factor in brain-growth and the erect attitude, bifocal vision, the structural configuration of throat, mouth, and brain-center making articulation possible, a large brain, and, in short, a more complex sensorium than that of any other animal.[8]

[4] C. J. Warden, *The Emergence of Human Culture* (New York, 1936), p. 46.

[5] Warden is replying, *loc. cit.*, to a statement of W. M. Wheeler, in *Social Life Among the Insects* (New York, 1923), p. 15.

[6] *Social Life Among the Insects*, p. 7.

[7] C. A. Ellwood, *Cultural Evolution* (New York, 1927), chap. 1.

[8] Hornell Hart, *The Technique of Social Progress* (New York, 1931), p. 33. Professor Hart has devised an "index of brain development," based on data derived from various sources, which places modern Europeans at the top of the scale with an index score of 100 and the gibbon at the bottom with 0. Between them are the orangutan, the chimpanzee, and the gorilla with scores of 17, 31, and 33, respectively; Pithecanthropus, Spy Neanderthal, Galley Hill-Brunn, the Australian aborigine, and Cromagnon man are scored with indices of 39, 64, 85, and 95, in order. This development surely constitutes more than an "inconspicuous difference in brain structure" between the ape and the man of which T. H. Huxley wrote in his *Man's Place in Nature* (London, 1894), pp. 142-143; cf.

In the process of these mutations affording a more complex sensorium, the human animal achieved a superior intelligence, characterized by a greater capacity for the formation of concepts,[9] more embracing and penetrating imagination with keener insight,[10] power to form ideals, and the capacity for syllogistic reasoning.[11] These characteristic aspects of the human endowment cannot be described as factors in the social process separable from the physical and social advantages, but they are very important in making man a potentially scientific animal. Furthermore, concepts are as indispensable in speech as they are in science, and powers of insight and reason are prime prerequisites for the latter—and the former. Anyone who has observed Cooley's incisive remark concerning Helen Keller's gaining insight into "the idea of language" will surely find this fact taking on a fresh meaning. Miss Sullivan had been trying to teach her words, which she associated only with individual objects (perceptions); but "she had not yet grasped the idea of language in general, the fact that everything had a name, and that through names she could share her own experiences with others, and learn theirs—the idea that there is *fellowship in thought.* This came quite suddenly."[12] When Miss Keller experienced this flash of insight, she rose immediately from what C. Lloyd Morgan has called percipience and perception in the animal mind to the reflective human level;[13] the only level on which culture and science are possible. At once there became effective for her the mental and social advantages of being human.

The social advantages of being human rest on the capacity for speech[14]

Frederick Tilney, *The Brain from Ape to Man* (New York, 1928), II, 893-896; cf. A. L. Kroeber and T. T. Waterman, *Source Book for Anthropology* (New York, 1931), pp. 67-76; cf. E. A. Hooton, *Up from the Ape* (New York, 1937), Part III.

[9] C. A. Ellwood, *The Psychology of Human Society*, p. 60; cf. Ralph Linton, *The Study of Man* (New York, 1936), pp. 65-66; cf. Leonard T. Hobhouse, *Mind in Evolution* (London, 1901), chaps. vi, ix, x, xii; C. Lloyd Morgan, *The Animal Mind* (London, 1930), classifies levels of intelligence as percipient, perceptive, and reflective. He denies that animals are reflective (p. 48).

[10] See experiments of Wolfgang Köhler with chimpanzees, reported on in *The Mentality of the Apes* (New York, 1925), pp. 37-38, esp. 53-55. Köhler reports that one of the chimpanzees, after much puzzling, had the insight to insert a smaller bamboo stick into a larger one to pull bananas into a cage by means of a tool of greater reach. It appears that he could do so, however, only when the animal's hunger, the goal, and the canes were present together.

[11] See L. T. Hobhouse, *op. cit.*, pp 295-300, and chaps. xiii-xiv; cf. C. Lloyd Morgan, *The Animal Mind,* chap. ii.

[12] C. H. Cooley, *Social Organization* (New York, 1909), pp. 62-63.

[13] See nn. 9 and 10, above.

[14] T. H. Huxley, *loc. cit.,* called speech "the grand distinctive character of man";

and the "prolongation of human infancy," which John Fiske emphasized in *The Meaning of Human Infancy*.[15] In the human infant the size of the brain increases from 300 to 400 per cent in the process of its growth, while the newborn chimpanzee's brain is about three fourths of its adult size.[16] Correlative with brain growth in the child is the development of acquired habit systems and the requisite plasticity for the development of human personality.[17]

Summing up these advantages, we find that a series of biological mutations provided man with superior powers of manipulation with his hands,[18] made a better thinker out of him,[19] laid the foundations for interactive learning by the use of speech and other symbols, furnished the basis for primary group relations and for the development within these groups of what Charles Horton Cooley defined as the distinctive characteristics of human nature—individual self-consciousness, the "social mirror" self, pride, ambition, vanity, abiding affection, loyalty, and altruism; the basis for a process through which man, born as an animal, becomes human.[20]

G. Spiller, *The Origin and Nature of Man* (London, 1931), pp. 106-107, criticizes Huxley's position and urges the concept of "inter-learning," which is more than the ability to speak. He says that "the anthropomorphous ape is congenitally confined to the exploration of his own thought, whilst the man . . . has . . . been able post-natally to incorporate into his mentality . . . the thoughts . . . of the thousands of millions of his kind, living and dead." The subhuman animal is thus "individuo-psychic," while the man is "specio-psychic." In *The Basic Fact in Sociology* (Hanover, 1938), pp. 29-31, he attributes "the measureless cultural upward trend in . . . history" to the "emergence of inter-learning," connected with a "mentality . . . developed more highly than that of any other species."

[15] New York, 1909; cf. W. N. Kellogg and L. A. Kellogg, *The Ape and the Child* (New York, 1933), for studies of their infant son, Donald, and the chimpanzee infant, Gua.

[16] M. F. Nimkoff, *The Child* (New York, 1934), p. 5.

[17] E. B. Reuter and C. W. Hart, *Introduction to Sociology* (New York, 1934), pp. 35-37; cf. F. H. Hankins, "Organic Plasticity versus Organic Response," *Social Forces*, VI (1928), 331-344.

[18] E. A. Hooton, *op. cit.*, pp. 131-141.

[19] *Ibid.*, pp. 141-198.

[20] C. H. Cooley, *op. cit.*, chaps. iii-v; cf. L. T. Hobhouse, *op. cit.*, chaps. xiii-xvii; cf. Kurt Koffka, *Principles of Gestalt Psychology* (New York, 1935), pp. 321-341; cf. Charles Darwin, *The Descent of Man* (New York, 1871), pp. 125-126, where Darwin says: "An anthropomorphous ape, if he could take a dispassionate view of his own case, would admit that though he could form an artful plan to plunder a garden—though he could use stones for fighting or breaking open nuts, yet that the thought of fashioning a stone into a tool was quite beyond his scope. Still less . . . could he follow out a train of metaphysical reasoning, or solve a mathematical problem, or reflect on God, or admire a grand natural scene. Some apes, however, would probably declare that they could and did admire the beauty and the colored skin and fur of their partners in marriage. They would admit, that though they could make other apes understand by cries some of their perceptions and simpler wants, the notion of expressing definite ideas by definite sounds had never crossed their minds. They might insist that they were ready to aid their fellow apes of the same

When, through the configuration of these mutations, it became possible for man, born as an animal, to become human, the second and the third aspects of the social process emerged as social and cultural change. At this point the full social process began. It was no longer necessary for the structure of the individuals of the species to change in order to bring about changes in the patterns of behavior. New patterns could now be invented and diffused. Before the sociocultural level emerged, the most dynamic animal behavior had, apparently, no cumulative effect.[21] After it emerged the dynamics of human interstimulation and response produced a cumulative effect in changes now distinctly social and cultural. On lower levels all learned adjustments had to be individual and nontransmissible by the use of symbols. The simple *Stentor* may make many complex adjustive movements in succession to escape from an obnoxious stimulus;[22] Paramecia may learn by experience to turn around in a narrow glass tube in two seconds instead of the original five minutes;[23] and "certain ants in the valley of the Amazons" may be, as G. F. Scott Elliott says, "at least in one respect, more intelligent than many savages";[24] that is, in the apparent foresight they exercise in building their nests in trees to escape inundation and in carrying up dirt along with the seeds of plants which will grow over the nests, protecting them from the heavy rains and the scorching sunlight; yet, for all their adjustive behaviors, however dynamic, none of these species, as a species, ever improves upon its patterns. The shelter patterns of the ants in the valley of the Amazons, if we accept the hypothesis of Wheeler, do not change; but those of the allegedly less intelligent savages not only change but improve. The patterns of the former are limited to the needs of the or-

troop in many ways, to risk their lives for them, and to take charge of their orphans; but they would be forced to acknowledge that disinterested love for all living creatures, the most noble attribute of man, was quite beyond their comprehension."

[21] Hornell Hart and Adele Pantzer, in their article, "Have Subhuman Animals Culture," *American Journal of Sociology*, XXX (1925), 703-709, seriously question the hypothesis that lower animals have no transmissible culture. They say, "But subhuman animals acquire culture not only from human beings but from one another." To substantiate this statement, they adduce lessons in flying, eating, bathing, swimming, walking, singing, and talking (one parrot learning from another) among birds of various species. They think these facts might indicate the transmission of culture in the fullest sense. C. M. Case, "Culture as a Distinctive Human Trait," *American Journal of Sociology*, XXXII (1927), 906-920, replies that these facts do not imply the transmission of culture in the cumulative sense because of the absence of tools and symbols as the carriers of a cumulative tradition.

[22] J. Arthur Thompson, *The Study of Animal Life* (London, 1917), pp. 161-162.

[23] G. F. Scott Elliott, *Prehistoric Man and His Story* (London, 1925), p. 63.

[24] *Ibid.*, p. 65.

ganism and to the kind of building they can do with the manipulative capacity they have. Individual intelligence helps them meet the concrete problems arising in real life situations in an environment to which the direction of their evolution has specialized them. *This intelligence does not invent new tools, or new shelters to build with them,*[25] but it does extend to helping the ants to fit individual nests into the contingent variations of sites available to the species. The patterns of the "savages" are not so limited. As Ellwood says,

> Peculiar instincts do not give rise to culture among the brutes, therefore we must turn to the distinctive traits of man to explain culture, and undoubtedly chief among these traits are his powers of intellectual abstraction especially of imagination and reasoning, which were made possible through his larger and more complex brain. Imagination and reasoning have made man a *creative* being.[26]

When imagination and reasoning had made man a creative being, and when, at the same time, he became capable of interindividual and intergroupal or interactive learning, the point had been reached at which history ceased to be "but a branch of biology."[27] The historic process really began at that point and, from that point on, advanced by a method different from that of either "cosmic"[28] or biological evolution. This fact is not clear to many students, however, as we shall see in the following outline of theories of historic development, which helps us to understand the true nature and the distinctive method of the social process.

V. HOW THE SOCIAL PROCESS GOES FORWARD

Those who hold to the materialistic theory of history deny the rise of new forces or methods either in the biological or historic process. They

[25] Ralph Linton, *loc. cit.*, reports that chimpanzees with which experiments were being carried on in Yale University showed some ability to sort out tokens, when not in the presence of food-vending machines, with which to ply the so-called "chimpomats" at the first opportunity to obtain the desired food; but that is very different from the capacity to invent or construct either the "chimpomats" or the tokens; cf. E. A. Hooton, *op. cit.*, 135-139, 141-164; cf. J. Arthur Thompson, *The Mind of Animals* (London, 1927), chap. xviii; cf. Fr. Alverdes, *Social Life in the Animal World* (New York, 1927), pp. 49, 51, 61—on p. 61, Alverdes says: "Nest building depends not on tradition and instruction but on a highly specialized instinct; for young birds construct a nest at the fitting season without ever having seen one. The only difference made by practice is that the older birds build more cunningly than the younger." Cf. R. W. G. Hingston, *Instinct and Intelligence* (New York, 1929), esp. chap. xix.

[26] C. A. Ellwood, *The Psychology of Human Society* (New York, 1925), p. 60.

[27] F. A. Woods, *The Influence of Monarchs* (New York, 1913), chaps. ii, xvii, and xviii. Woods supports a "gametic interpretation of history." See p. 275.

[28] The term "cosmic" is here used in the sense given it by Ellwood, *op. cit.*, pp. 40-41.

take Sir Charles Lyell's principle of "uniformitarianism" and turn it around. Lyell insisted, in criticism of the cataclysmic theory of geological change, that "no causes whatever have, from the earliest times to which we can look back to the present, ever acted but those now acting; and that they never acted with different degrees of energy from that which they now exert."[29] Of course this principle is as important for science as it is sound; but the converse of the proposition, namely, that no causes or factors are operating today except those which have operated always, despite the contentions of rigid determinists, does not seem to be true. Rather it seems clearly to be false, when examined in the light of the known facts of biology and history and in view of the fact that he who holds it has to bear the adverse weight of its logical implications.

The adverse weight of its logical implications rests in the fact that, if it be true, apparently the whole of human history is only a description of involved physicochemical processes as they have worked themselves out in a chain of causal sequences, and as they may be expected to continue, blindly, to work themselves out to and beyond the end of human time. It would probably, also, mean that all memory of past events and all expectations and anticipations of the future as conscious states or facts of awareness have had and will have little or no part in the historical process as causes; and that the conscious aspect of experience is but an epiphenomenal "glow" which accompanies individual and historic human responses to present and antecedent stimuli without in any way affecting those responses. This theory would imply that the conscious aspect of all tradition, oral and written history, is only an introspective report on the operations of physicochemical machinery, which has moved on from one great epoch to another, grinding out clans, tribes, nations, the arts, the sciences, and the world's great religions; and that the study of this introspective report called history would probably not constitute effective stimuli to change in any way the future of the physicochemical, or the historic, process. And, if the study of the introspective report presents no effective stimuli, there is probably nothing more useless than the pursuit of history so conceived. On the other hand, if the study of history as an introspective report of a physicochemical process were in any way to

[29] Quoted in C. Henshaw Ward, *Charles Darwin* (Indianapolis, 1927), pp. 72-74. Lyell's position is exactly as represented in this quotation, but I do not find the quotation exactly as it stands here in his ninth edition (New York, 1860), which is the only one accessible to me.

influence the further direction of the process, the event would discredit the doctrine of a psychophysical parallelism in which the only effective causal aspect is purely physical.[30]

Some writers have clearly held to a position of radical determinism. Lyell's famous contemporary, T. H. Huxley, seems to have been an example, although Huxley was not consistent in his position.[31] Others, perhaps, have held it without pursuing the doctrine to its logical consequences. As a psychologist, Floyd Allport, for instance, is an epiphenomenalist who might not agree that his theory of the nonefficacy of "desire, feeling, will, or purpose"[32] in the behavior of the individual would lead to a physicochemical interpretation of history; and so E. B. Holt[33] and A. P. Weiss[34] as thoroughgoing behaviorists. Yet, to hold such a doctrine of the individual scarcely admits of the emergence of one new factor either before or with the coming of the human species, except for that of mechanical complexity.

When this materialistic hypothesis is studied in the light of the facts of biology and evolution, in the light of the manner in which the social process arose, it does not seem tenable. It is apparent that pure mechanism has had no monopoly in our world, at the latest, since the arrival of the simplest forms of life.[35] Materialistic monism does not square with any of the facts of experience. The human animal, or, inferentially from the data studied, any other animal is not merely a finely adjusted mechanism; the behavior of the reflexologist, who is writing a book to reorganize the neural organization of some other reflexologist who has ground out a different conclusion, one that is *invalid*, whatever validity may mean in such a circumstance, does not consist fundamentally of sheer cerebration; of the plugging in and out of engrammatic traces as physicochemical impressions and their recombinations. If so, how does the "reflective" process enter into it? His experience is qualitatively different from physicochemical combinations and reactional processes. The bodily changes that take place in the ebb and flow of his emotions can by no

[30] Howard E. Jensen, "Introduction," in C. A. Ellwood, *Methods in Sociology* (Durham, 1933), p. xxii.

[31] J. A. Thompson, "Is There One Science of Nature?" *Hibbert Journal*, X (1912), 308-327, 322; cf. C. Lloyd Morgan, *Instinct and Experience* (London, 1913), p. 148.

[32] Floyd Allport, *Social Psychology* (New York, 1924), pp. 2, 8.

[33] E. B. Holt, *The Freudian Wish and Its Place in Ethics* (New York, 1915), pp. 67-68.

[34] A. P. Weiss, *A Theoretical Basis of Human Behavior* (Columbus, 1925).

[35] Lloyd Morgan, *Instinct and Experience* (London, 1913), chap. iv; cf. Bernhard Bavink, *The Natural Sciences*, trans. H. S. Hatfield (New York, 1932), chap. v.

stretch of the imagination be identified with the experienced quality of his emotions. There is an element in experience which is neither overt nor chemical. Yet, Bechterev writes that

> Man's adjustments of his outer manifestations in relation to another being, whether animal or human, do not fall under the head of psychical processes, as may be *thought,* but are themselves outward manifestations. This may be seen from the fact that we may merely fain to threaten somebody, and so call out a response on his side, or we can laugh when *feeling inward sorrow,* and even infect others with our laughter. . . . A frog with its medulla oblongata transected performs complex movements with its leg in wiping a solution of acid off the surface of its back.[36]

As a scientist Bechterev was a reflexologist; as a human being he *thought* and *felt inward sorrow* just as anyone else does. His own life probably demonstrated what it meant at times to *feel* one thing and at the same time to *feel* another thing in his sympathetic recognition of how others would *feel* if he expressed himself in one way rather than another; and this complex of intelligence and emotion expressed itself *purposively* in the light of this imagined effect upon others. It is therefore difficult to see how it can be held that there is no difference in the quality of complex reflexes and of consciousness and that consciousness has no causal efficacy.

It seems quite certain that new forces have emerged in the process of evolution; that *consciousness as meaningful experience,* which Dewey has called the "late comer,"[37] is efficient in itself to influence the total response of organisms; that the rise of the capacity to enrich this experience by interindividual and intergroupal learning and the concomitant expansion of the capacity for creative intelligence, or imagination, as the focus of experience per se, have been the effective forces in the historic process, maintaining continuity and giving birth to remarkable changes hardly explicable by the hypothesis of epiphenomenalism or materialistic monism.

Lyell, of whom we spoke above, did not believe in the converse of his uniformitarian proposition. He contended that "In reasoning on the state of our globe immediately before our species was called into existence, we may assume that all the present causes were in operation, *with*

[36] V. M. Bechterev, *General Principles of Reflexology* (London, 1933), p. 45. Italics are mine.

[37] John Dewey, *Experience and Nature* (Chicago, 1926), p. 32; cf. pp. 7, 25-28, and chap. vii.

the exception of man."[38] And we may agree with Lyell today, without having the same reason for making the exception that Lyell had. He apparently believed in the special creation of man.[39] This view led him to believe that the coming of man constituted a break in evolutionary continuity. We have seen that the theory of such a break is untenable; but the theory of emergent evolution, advanced by C. Lloyd Morgan,[40] makes the theory of physicochemical determinism unnecessary for the maintenance of continuity, and the facts observed in both animal and human life discredit it.[41] Emergent evolution would have to depend only on the synthesis of lower levels of reality to produce the higher levels, on each of which, without a break in continuity, new forces could operate. As Hornell Hart says:

> Protoplasm is not a mere chemical compound; it is a new kind of thing, unpredictable in merely chemical terms. Man is not a mere protoplasmic compound; psychology cannot be reduced to biology. Social groups are not mere aggregations of human beings, and their behavior cannot be adequately interpreted in terms of individual psychology.[42]

And we may add, the psychosocial process is neither the same as the older physicochemical process nor the biological process, it cannot be interpreted in physicochemical or biological terms, and it does not proceed by the same methods. For all that, it is lawful; for, as Professor Hart continues:

> To say that unprecedented combinations of old elements produce unpredictable results does not mean that these results are causeless or lawless. After the new combination has been repeated often enough, under scientific observation, it is possible to discover the laws which describe it, and to become able to predict, and perhaps control, its further occurrences. H. S. Jennings makes a fundamental point when he says that emergent evolution makes no difficulties for the thorough-going experimental determinism on which depends the possibility of science.[43]

Hence, materialistic determinism is not a necessary hypothesis to furnish a basis for science,[44] just as it is neither necessary nor adequate as a

[38] See Lyell, *op. cit.*, chap. ix, and Henshaw Ward, *op. cit.*, p. 74.

[39] *Op. cit.*, chap. ix.

[40] C. Lloyd Morgan, *Emergent Evolution* (New York, 1922); cf. Bernhard Bavink, *op. cit.*, p 433.

[41] William Patten, *The Grand Strategy of Evolution* (Boston, 1920), pp. 291-295; see esp. J. Arthur Thompson, *The Mind of Animals*, all chapters for data and chap. xi for his conclusions; cf. also R. W. G. Hingston, *Instinct and Intelligence*, p. 287.

[42] Hornell Hart, *Technique of Social Progress*, pp. 302-303.

[43] *Loc. cit.*, cf. C. Lloyd Morgan, *Instinct and Experience*, pp. 148-149.

[44] Cf. Federigo Enriques, *Problems of Science*, trans. Katharine Royce (Chicago, 1914), chap. vi Enriques thinks it irrelevant.

theory of history or of the social process; and if it is not adequate for these, it is not adequate for science, either.[45]

If there are physicochemical theories of history, there are also many biological theories of progress—theories which hold that the improving social adaptation of the human species is due to changes in heredity, arising from mutations in combinations of genes in the chromosomes. So famous a writer as William McDougall stated that

> . . . the traditional stock of knowledge and morality has been slowly accumulated bit by bit; and every bit, *every* least new addition to it, has been a difficult acquisition, due in the first instance to some spontaneous variation of some individual's mental structure from the ancestral type of mental structure.[46]

While, on the whole, McDougall's psychology is hormic or purposive, this statement, taken as it stands, would seem to have much the same implications as those to be found in the hypothesis of materialistic determinism to which the purposive psychologist clearly cannot subscribe. This observation rests upon the fact that, in the statement, McDougall has emphasized *changes in the structure as the effective factors in changes in the tradition.* There is, however, possibly one difference to be noted in the two positions. Professor McDougall's statement might imply that one biological variant rather than another can profit largely by experience and make the reading of history and his knowledge of the cumulative tradition effective in his times in the creation of new patterns. Yet, to make such a statement as it stands is to fail to do justice to the importance of culture as a factor in human invention and either to overlook or unduly discredit the development of human culture taking place clearly within the human social process.

[45] On the relation of mind and body the following sources have been consulted: Robert Briffault, *Psyche's Lamp* (London, 1921), pp. 1-50; William F. Clarke, "The Significance of William Blake in Modern Thought," *International Journal of Ethics,* XXXIX (1929), 223-224; R. W. Church, *A Study in the Philosophy of Malebranche* (London, n. d.), pp. 19-23; Hans Driesch, *The Crisis in Psychology* (Princeton, 1925), pp. 123-126, and the whole book; J. F. Markey, *The Symbolic Process* (New York, 1928), p. 123, on the view of R. W. Semon; George H. Mead, *Mind, Self, and Society* (Chicago, 1934); C. Lloyd Morgan, *Instinct and Experience* (New York, 1912), pp. 263-264, 271; Charles W. Morris, *Six Theories of Mind,* pp. 133, 153, 249, 129-134, 114-115, 149, 219-220; F. Max Muller, *The Science of Thought* (Chicago, 1888), pp. 85-89; C. K. Ogden, *The Meaning of Psychology* (New York, 1926), pp. 26-32, 45; C. A. Strong, *Why the Mind Has a Body* (New York, 1903); M. C. Swabey, *Logic and Nature* (New York, 1930), pp. 50-51; Herman Weyl, *Mind and Nature* (Philadelphia, 1934), pp. 3-4.

[46] William McDougall, *The Group Mind* (Cambridge, 1920), p. 210; cf. F. A. Woods's phrase, "gametic interpretation of history" (*op. cit.,* p. 275).

The evidence against biological variation as the method by which cultural change proceeds is, in part, the fact that there has been relatively little change in the innate capacities of the human stock since the arrival of the *Cromagnon* racial type; and it is likely that the infant of *Homo-Neanderthalensis* was much more like the modern infant than interpretations of head forms would suggest.[47] Yet, the cultural heritage of the modern world is immeasurably greater than that of these prehistoric races of man.

No claim can be made, however, that biological changes have ceased.[48] The modern races have risen since the emergence of the psychosocial or the sociocultural level,[49] and individual variations have, of course, ranged all the way from idiocy to genius in every generation, with possibly as great a proportion of primitive populations on the latter level as exists today. Yet, the moron's comprehension of the modern world may be immeasurably greater than the primitive genius had of his relatively "simple" world; for the moron of today culturally stands upon the shoulders of past generations and, from that vantage point, takes in the scene, while the finest brain in the most complete sensorium of primitive man, for lack of culturally supplied data, had to lie relatively fallow.[50]

We may well believe that the same ranges of intelligence prevail among all modern races. For, when we choose a large sample of studies of Negro-White intelligence, of which racial theorists have made so much, and criticize the conclusions in the light of Newman, Freeman, and Holzinger's studies of the intelligence of identical twins reared apart, the results give little, if any, support to the theory of the racial inferiority of the Negro.[51]

These studies, made in the University of Chicago, extended to nineteen pairs of identical twins reared apart. One pair, brought up with very different opportunities, were scored twenty-four points apart in their

[47] Hornell Hart, *op. cit.*, p. 33, as we have seen by his index of brain development, scored modern Europeans at 100, Cromagnon at 95, Spy Neanderthal at 64, and Galley Hill-Brux-Brun at 85. The Cromagnon type might, however, have been superior to the modern races of man.

[48] Cf. William K. Gregory, "Dawn Man or Ape?" *Scientific American*, CXXXVII (1927), 232; cf. Frederick Tilney, *The Brain from Ape to Man* (2 vols.; New York, 1928), II, 893-936.

[49] Cf. G. Eliot-Smith, *Essays on the Evolution of Man* (London, 1927), pp. 101-110.

[50] E. T. Hiller, *Principles of Sociology* (New York, 1933), p. 344.

[51] Reported by Dr. Frank N. Freeman, "Heredity and Environment in the Light of the Study of Twins," *Scientific Monthly*, XLIV (1937), 13-19; cf. H. H. Newman, F. N. Freeman, and K. J. Holzinger, *Twins* (Chicago, 1938), Part III.

performance on the same intelligence test. That put one of the twins in the highest fifth and the other in the lowest fifth of the general population in level of intelligence. Other pairs, likewise brought up in variable backgrounds, scored, in one case, a difference of nineteen, and, in another case, of seventeen points.

When we turn to the studies of comparative Negro-White intelligence made by Yerkes,[52] Pintner and Keller,[53] Thorndike,[54] Hirsch,[55] Peterson,[56] McFadden and Dashiell,[57] Sunne,[58] Arlitt,[59] Derrick,[60] Schwegler and Winn,[61] Pressey and Teter,[62] we find nowhere in the list as wide a gap between the average performance of the races as Newman and his collaborators found between these identical twins with such variant opportunities.

Varying cultural achievements among different racial stocks today, then, will have to be explained otherwise than as a result of the biological factor. There is no reason to believe that Negroes and other so-called inferior races are innately incapable of being scientists, *if they have the opportunity, the culturally supplied data.* No one knows how many of them can equal the performances of George Washington Carver at the Tuskegee Institute.

Another theory of the "dynamics" of historic change which fails to do justice to the importance of culture as a factor in innovation, in science and invention, is psychological determinism, which may be illustrated by

[52] R. M. Yerkes, "Psychological Examination in the U. S. Army," *Memoirs National Academy,* XV (1921).

[53] R. Pintner and R. Keller, "Intelligence Testing of Foreign Children," *Journal of Educational Psychology,* XII (1922), 214-222.

[54] E. L. Thorndike, "Intelligence Scores of Colored Pupils," *School and Society,* XVIII (1923), 563-570.

[55] N. D. Hirsch, "A Study of National-Racial Mental Differences," *Genetic Psychology Monographs* (May-July, 1926), p. 287.

[56] J. Peterson, "Comparison of White and Negro Children in Multiple Choice in Learning," *Proceedings of the American Psychological Association* (1921), pp. 97-98.

[57] J. H. McFadden and J. F. Dashiell, "Racial Differences as Measured by the Downey Will-Temperament Test," *Journal of Applied Psychology,* VII (1922), 30-53.

[58] D. Sunne, "A Comparison of White and Negro Children," *School and Society,* XIX (1924), 469-472.

[59] A. H. Arlitt, "The Relation of Intelligence to Age in Negro Children," *Proceedings of the American Psychological Association* (1921), p. 14.

[60] S. M. Derrick, "A Comparative Study of Seventy-five White and Fifty-two Colored College Students," *Journal of Applied Psychology,* IV (1920), 316-329.

[61] R. A. Schwegler and E. Winn, "A Comparative Study of the Intelligence of White and Colored Children," *Journal of Educational Research,* II (1920), 838-848.

[62] S. Z. Pressey and G. P. Teter, "A Comparison of Colored and White Children . . . ," *Journal of Applied Psychology,* III (1919), 277-282.

Lester F. Ward's theory of the desires as the social forces, as set forth in *Dynamic Sociology*.[63] For him the desires were "the psychic factors of civilization." They set all the goals of human striving, and intelligence really achieved nothing, except as a guide to these goals; yet, as a guide to these goals set by the desires, he considered "mind" the only variable. He wrote:

> Mind is the variable, the other forces the constants. Put the former equal to zero, and we have stagnation. Give it a series of increments, and we have a series of results corresponding to these increments. In animals the mind tone is low, and progress is correspondingly slow. In man it presents a series, and we find degrees of social development and elevation proportionate to the increment as we rise from the lowest to the highest of the human races.[64]

The weakness of individualistic psychology is its failure to recognize the priority of culture and the group. As Ellwood says,

> Psychological individualism must therefore be given up; but the main truth which it sought to emphasize, that a human group is not a simple mass, but is made up of relatively independent, autonomous individuals, will stand. The individual is not merely a relatively independent center of energy, but is the variable, and so the creative, element in group life. The influence of the creative personalities of individuals upon group life must be taken into account.[65]

There are two related theories of the social process, however, that fail to take the influence of creative personalities into account in the development of science and culture. One puts the stress upon the factor of collective behavior and the other on the sole factor of culture as the creator of more of the same. Roughly speaking, these groups come under what P. A. Sorokin has called the "sociologistic school" of sociologists who maintain that "sociology has to be built immediately on biology, while psychology needs sociology as one of its bases." This position is the reverse of that of the psychological school, which insists "on the necessity of putting psychology after biology and before sociology, as its immediate basis."[66]

The whole school of Durkheim, as representative of the first theory, stresses the group origin of collective representations, or cultural and symbolic values, the fixation of all cultural traits by responses conditioned

[63] Lester F. Ward, *Dynamic Sociology* (2 vols.; New York, 1883, 1897).
[64] *Ibid.*, II, 697-698.
[65] *Psychology of Human Society*, p. 80.
[66] *Contemporary Sociological Theories*, p. 433.

through collective participation in highly suggestive situations.[67] Little room for the individual innovator is implied, the individual merely responding to collective representations collectively produced. Gumplowiczs went so far as to say that the individual never thinks, but only his social community; that "man's mind and thought are solely the product of his social medium, of the social element in which he arose and lives."[68]

We shall see that it is fallacious to hold, however, that the individual is so group-bound that he is incapable of significant innovation, of making a contribution to the process of collective learning in any age. But once tradition has taken hold upon groups and the persons that constitute them, any innovation contrary to the character of the ideas existing in that group will be very difficult to advance; in fact, it will not emerge until forces are thrust in from the outside to break the "cake of custom," or a cataclysm occurs in nature to make the old ways inefficient, or exceptional individuals appear who resent the *status quo* because it has not fitted into their needs in the past and does not fit into their expectations of the future; persons whose experience gives them the courage to challenge some aspect of the system and who have the insight to suggest ways that would constitute more adequate controls of involved situations.

In any event, the force of culture is so strong that it led Professor Sumner to be a culture determinist, or to take a closely kindred position. Sumner believed that the individual innovator, or any single generation, would have as little power to escape from the force of the current of culture, consciously to change its direction or to modify its channel, or to take from it, or to add to it purposively,[69] as Durkheim seemingly attributed to an individual to do anything but respond to collective representations. Yet, Sumner believed that conscious innovation is impossible, once it gets into the mores.[70]

The position of R. H. Lowie is apparently a near approach to cultural determinism, but, when carefully analyzed, is probably a theory of the interaction of psychological and cultural factors in the social process.[71]

[67] E. Durkheim, *Elementary Forms of the Religious Life*, trans. J. W. Swain (London, 1914), chap. vii.

[68] Ludwig Gumplowiczs, *Outlines of Sociology*, trans. F. W. Moore (New York, 1899), pp. 156 ff.

[69] William Graham Sumner, *Folkways*, pp. 87, 92, 168, 455.

[70] C. M. Case, *The Social Process and Human Progress* (New York, 1931), pp. 81-91; cf. A. G. Keller, *Societal Evolution* (New York, 1915), chaps. iv-v.

[71] R. H. Lowie, *Culture and Ethnology* (New York, 1929), chap. i.

Since we shall be so much concerned with the factor of imagination, the following quotation from Lowie is appropriate here:

> We may rummage all the psychological seminar rooms in the world and yet shall find no reason why the Arabs learned the technique of paper-making from the Chinese instead of ignoring it or only importing Chinese paper. . . . Nor are we more fortunate when we turn to psychology for an account of how the original Chinese inventor came to conceive his epoch-making idea. This fact, of course, falls under the heading of "imagination," and about imagination psychologists have much to tell us. But what, after all, does their interpretation amount to? We learn that imagination, as distinguished from the power of abstract thought, is the power of forming new concrete ideas. . . . "The inventor of a new mechanism," says Hoffding, "combines given elements, the laws of whose activity he knows, into a totality and a connection which has no complete parallel in experience." . . .
>
> We need hardly go farther to realize the impotence of psychological science for illuminating the *psychology* as well as the history of the paper-making art . . . it is too general. It explains the invention of the steam engine and the phonograph, the sewing machine and the harvester, no less than the origin of paper-making. We, however, do not want to know merely what ultimate pyschological processes the invention of paper-making shares with all other inventions whatever, but also the differential conditions that produced this one and unique result under the given circumstances.[72]

But Gestalt psychology would insist on taking in "the differential conditions that produced this one and unique result under the given circumstances," because it would take in the total situation, with the inventor as an integral part of it, not as an environmental milieu outside the inventor, who performs as if the culture were nonexistent. The psychological and the cultural factors always constitute a dynamic interactive system which controls the relations of these factors as its components.

In other words, any sort of single-factor determinism is wrong. Purely psychological forces do not control the social process; neither do the purely cultural. Nor does the group mind operate as the only force by the exercise of external constraints.

We may, to contrast these varying viewpoints, liken the social process to an ongoing river. Those who hold to the theories of biological and psychological determinism see this river as one fed by innumerable tributaries, some large, and some very small, flowing in as contributions of individuals to the social process as if from outside it. These are the great men and the little men. A large majority of the little streams never reach

[72] *Ibid.*, pp. 11-12.

the main river, being caught in little niches or lost in the sand. These are the inarticulate masses. Those who hold to cultural determinism, however, see the river swelling—out of its own being. Those who conceive of the interaction of psychological and cultural factors look upon a cultural stream flowing through the personalities of individuals organized in groups and emerging in each succeeding generation increased in volume and flowing in accordance with modified patterns. Or, to put it in another way, the social process is like a football game in which the teams with their interactive systems march up and down the field. The plays take place in social time, and the teams are organized in social space. Social interaction and social change are going on; and when a team is failing, it readjusts its patterns; but it has its leaders as well as teamwork.

The social process, we may say, then, by way of summary, has three main aspects: (1) social interaction, (2) social change, and (3) cultural change; and we may observe that social change is a broader term than cultural change, including events such as disasters, population movements, and economic fluctuations as both products of and factors in cultural change; that social interaction in the present takes place either in accordance with a commonly accepted pattern of culture or in conflict over varying cultural patterns; that these cultural patterns organize groups into interactive systems and set them to working together or against one another, or both; that this interaction may be viewed as taking place in the axis of social space—the still-picture view; that social change must be viewed, however, as taking place in the axis of time—the moving-picture view.

The still-picture view of social organization would be represented by a census of the United States or of a city at the beginning of any decade, so that every ten years we get a cross-section view of "the state of the nation," or of the city, from which interim movements are inferred. The moving-picture view would be, in lieu of a God's eye view of the process, an imaginative reconstruction of the continuity of the ongoing process, coming not merely from studying census data but from significant and continuous participation in it, coupled with the ability to view it with some detachment. As Booth Tarkington writes in *The World Does Move:*

> Cameras of the new age sometimes record on strips of film the slow life of a plant from the seed to the blossoming of its flowers; and then there is thrown upon the screen a picture in which time is so quickened that the plant

is seen in the very motions of its growth . . . swelling to maturity all within a few minutes. So might a film record be made of the new growth bringing to full life a quiet . . . town. . . . The picture would be dumbfounding . . . block after block of heavy old mansions would seem to topple; row after row of buildings would vanish almost simultaneously; families would be shown in flight, carrying away their goods with them from houses about to crumble, miles of tall trees would be uprooted; the earth would gape, opening great holes and chasms; the very streets would unskin themselves and twist in agony; every landmark would fly dispersed with powder upon the wind and all old established things would disappear. . . . [But the viewpoint, while it was going on, of the men who made the growth would not be shown in the picture.] For the men who made the growth saw not the destruction, but only the city they were building; and they shouted with their worship of that vision. . . . They shouted as each new skyscraper rose swimming through the vast drifts of smoke; . . . as . . . clean old business streets collapsed and the magnificent new and dirty ones climbed above the ruins; . . . [as] business went sweeping outward . . . tearing away the houses where people had lived contentedly for so long, and they shouted again as the factory suburbs marched upon the country side . . . [producing] a perpetual smoke mist, so that the distant level plain seemed to be . . . an ever fuming volcano.

The social process does move in such a way that a vast majority of those who are participating in its interactive systems at any given time do not see "the destruction, but only the city they [are] building"; but what they are doing does have a part in causing many "old established things" to "disappear"; in ushering in changes that call for continual reintegration of the social configuration. But the process of change is not all unconscious and not all unintended. When events precipitate crises which involve uncertainties, perhaps even a breakdown, in the interactive system, the necessity for readjustment calls the attention of outstanding persons, whose "life-space," to make use of Kurt Lewin's terminology, is "structuralized" within the larger social configuration—clan, tribe, city, region, economic organization, nation, international situation, and so on.[73] The attention these outstanding persons give to the problem of finding new controls, or new adjustive mechanisms, leads to reflection, which results in insight into the mechanisms applicable as required controls.[74] These inventions, or discoveries, while bringing reorganization in one aspect of

[73] Kurt Lewin, "Field Theory and Experiment in Social Psychology" *American Journal of Sociology*, XLIV (1939), 878; cf. J. F. Brown, *Psychology and the Social Order*, pp. 458-461, and chap. xv.

[74] W. I. Thomas, *Source Book for Social Origins* (Boston, 1919), pp. 3-26; cf. C. A. Ellwood, *Cultural Evolution*, chap. iii.

an interactive system, may bring a crisis at times in another aspect of the same system—as illuminated by the concept of *culture lag,* or functional inconsistencies in the complexes of a culture. Then the same process of attention to problems, reflection, insight, and control is repeated for the new set of problems. It is thus that the disturbance of the social equilibrium and the process of reintegration go on simultaneously, so that society, viewed in the axis of social space as present interactive systems, such as family, community, political, and economic organization, must also be viewed as moving in the dimension of social time; as changing in patterns of economic, familial, and political relationships and in patterns of technological controls.

It is in this dialectic of disturbance and adjustment, instability and stability, change and persistence, that we find the very taproot of science; the source from which it emerges. It becomes necessary, however, to make a closer analysis of the factors in its emergence and of the principles of its growth.

VI. FACTORS IN THE EMERGENCE AND DEVELOPMENT OF SCIENCE IN THE SOCIAL PROCESS

We may summarize the factors operative in the emergence and the development of science in the following more or less logically successive propositions:

1. Organic evolution produced the human species as a potential *homo scientificus,* but it did not, of course, produce science; and no individuals are born as scientists today.

2. The human species did not begin with a knowledge of either scientific principles or with bodies of scientifically applicable data. For this reason man's development as a "scientific animal" had to be very slow.

3. This development took place as an integral part of the process of change in a search for adequate adjustments; as an attempt to uncover the laws of nature, it may have been often to know them for the sake of knowing them but, more often, to find out whether and how they could be controlled to effect needed adjustments; and, as we have seen, the method and the knowledge was that of common sense long before science became a "formal system of knowledge built up on a basis of observation and experiment . . . compacted by reflection on the data thus supplied";[75] perhaps a half million years or more before scientific research arose as

[75] J. Arthur Thompson (ed.), *The Outline of Science* (New York, 1922), IV, 1165.

a deliberate attempt to control the learning of the investigator in a given field by methods hypothetically relevant to the field of reality as hypothetically conceived.

4. As a search for adjustment, whether through common-sense observations or by the methods of controlled experimentation, the advancement of science has been the result of learning (a) through the interplay of psychological and cultural factors, (b) as they impinge upon and work in and through interactive individual personalities.

5. The cultural factors interactive with psychological factors in the development of science have been and are: (a) the elemental data necessary to multicombinations that take place in either technological or social discoveries, inventions, or innovations; (b) the hampering factor of stubborn errors that have developed and persisted in various aspects of culture;[76] (c) the "major premise" of the "cultural mentality" out of which emerge the philosophical and methodological assumptions underlying all scientific method;[77] and we might also add, the cultural definition of goal values that make certain inquiries seem worth or not worth pursuing.[78]

6. The psychological factors are: (a) individuo-situational, involving the relations between the person and the goal and all the factors having a bearing upon that relation, the behavior of the investigator himself being a part of the total situation,[79] and (b) interactive and groupal, involving collective or interactive learning. With respect to the force of either one of these factors the most dispassionate scientist is no exception. The first includes the driving forces that exist in the relations of the subject and the object, the investigator and the problem, arising out of the attractiveness that particular problem has for the investigator or investigators and out of the selective and dynamic responsiveness of the attention they give it. This dynamic responsiveness will depend upon the uniqueness of the personalities of the investigators, the groupal situation, and the cultural evaluation of the goals sought. The second, interactive learning, is

[76] Joseph Jastrow, *The Story of Human Error* (New York, 1936), pp. 1-2; cf. C. A. Ellwood, *Cultural Evolution*, pp. 251-260, 112-120.

[77] P. A. Sorokin, *Social and Cultural Dynamics* (4 vols.; New York, 1937), I, chap. ii; II, chaps. iv-vii.

[78] R. E. Park and H. A. Miller, *Old World Traits Transplanted* (New York, 1921), p. 8, for a letter written by a Mohammedan in response to a request for information about his city.

[79] Kurt Lewin, *Principles of Topological Psychology*, trans. Fritz and Grace M. Heider (New York, 1936), p. 12.

obviously important in science,[80] because any group has borrowed incalculably more *traits of culture* than it ever invented. This fact has its implications for scientific research today. But borrowing depends upon contacts with the past as well as with contemporaries, which also has its implications for modern research if we are not to repeat the mistakes of the past.

7. This interplay of psychological and cultural factors has become effective in the production of new elements of science and of culture only as it takes place in and through interacting individual personalities.

8. These interacting personalities have been more than passive converging points for the cultural intake.

It is obvious that there could have been no growth of science, or of culture, without the factors of interindividual and intergroupal learning; that every inventor, or scientist, depends upon "the efforts of countless toilers whom the world does not know"; that the history of every invention "is one of slow and continuous development which can be traced back, like the branches of a tree, to its junction with other inventions, and so on until the beginnings of all are found to lie in the simplest contrivances of prehistoric man."[81] In fact, discoveries are so dependent upon the cultural situation that W. F. Ogburn intimates that most inventions are inevitable, provided, of course, that creative minds are present when the constituent elements of a new trait or invention have arisen in the social process; and he can give one hundred forty-eight examples of parallel inventions to support his hypothesis.[82] It must be remembered, however, that there is no innovation outside the minds of individuals;[83] that, though these individuals have to be persons who stand at strategic positions in the social process to receive ideas from the stream of culture which can be combined in given ways, *it is within their mental processes that the combinations take place, and it is by their resultant behavior that these combined elements are reintroduced as new traits in an enriched stream of culture.*

9. These individual personalities, then, have been the initiating forces in the emergence of the new traits.

Gestalt psychologists are right in stressing the concept of "life-space"

[80] G. Spiller, *op. cit.*, pp. 356-359; cf. E. T. Hiller, *op. cit.*, p. 343.
[81] E. T. Hiller, *op. cit.*, p. 343.
[82] W. F. Ogburn, *Social Change* (New York, 1922), pp. 82-102.
[83] A. Goldenweiser, *Early Civilization* (New York, 1922), p. 15.

with its relational and time dimensions as the total situation shedding light upon human behavior. To quote Lewin:

> Every scientific psychology must take into account whole situations, i.e., that state of both person and environment. This implies that it is necessary to find methods of representing persons and environment in common terms as parts of situations. We have no expression in psychology that includes both. For the word situation is commonly used to mean environment. In the following we shall use the term *psychological life space* to indicate the totality of facts which determine the behavior of an individual at a certain moment.[84]

But to make all the factors in this total situation, this "psychological life space," equally creative in the resulting behavior would be to overlook the dynamic qualities of the personality who is part of that situation.[85] He is not one billiard ball among so many billiard balls (Lewin does not mean this, of course), whose play-space is "structuralized," delimited and defined, within the framework of the table and what is on it. He is more dynamic than that, if anything changes *socially,* if anything is *created.*

In the development of science and culture, the group may have been clamoring for new adjustive controls, the stream of culture may have poured a vast amount of data into the storehouse of a man's mind—that is, it may have supplied him everything essential to discovery *but the relatedness of these data,* and he may be in pursuit of the desired goal; yet he may not have the capacity for the required insight. He just "never thought of that." He could get at relatedness only through creative and controlled imagination.

10. The achieving force par excellence in trait-initiating individual personalities has been and is controlled and creative imagination, which includes insight and makes learning by the conditioned response and psychic accident possible.

These latter theories, together with the theory of trial and error, are supplementary rather than contradictory to the concept of learning by creative insights. As to learning by trial and error, it would be a mistake to think of the difference between the world of *then* and *now* as resulting merely from the fact that the human species, in its search for adjustments, has tried and failed or succeeded, much as a rat that runs a maze, except that a much more complex rat has been running a much more difficult

[84] Kurt Lewin, *loc. cit.*

[85] Cf. F. H. Hankins, "Organic Plasticity versus Organic Responsiveness in the Development of Personality," *Publications of the American Sociological Society,* XXII (1928), 44-47, 49-50.

maze. Much learning has been of this sort, but the cultural advancement of man, the data show, has not all been the result of blind fumbling.[86]

It would surely also be a mistake, in accounting for the growth of science, to depend entirely upon the theory of conditioned response as a corollary of trial and error resulting in pleasure and pain. For, by this theory, man would have had to acquire every trait of culture or personality and every bit of scientific knowledge by mechanically responding to stimuli which are "biologically adequate," that is, effective in calling out a response, as Watson and Allport would say,[87] without the individual's having had any previous experience with the stimuli, and learning to respond to stimuli in space and time—stimuli which become symbolic of objects and behaviors we hate or fear or love; of values we withdraw from or approach, until man had thus built his culture—all his knowledges, traditions, arts, skills, scientific systems; every utilitarian device from skyscrapers to bobby-pins; until he had acquired these passively as substitute stimuli, and personality in the same manner, as a bundle of habit systems, or mere modified responses.

These theories and the related theory of psychic accident, which holds that all progress has been the result of accidental discoveries, contingent upon the pursuit of goals often not even related to the value inherent in the discovered mechanism or process, come out of what is surely a mistaken theory of the human mind, which has been discussed under the theory of physicochemical determinism. They assign to man a passive nature[88] in a world in which he neither could be nor has been passive.[89] Man does learn by all three methods, but they are either dependent upon or supplementary to the method of creative insight.[90]

11. Creative insight in interacting individual personalities who have had a part in the development of scientific principles has been dependent upon (1) wholeness of vision, (2) intimate participation as a part of a total situation, (3) dramatic imagination, especially in the realm of social relations, and (4) the possession of objectivity.

[86] E. C. Tolman, *Purposive Behavior in Animals and Men* (New York, 1932), chaps. xxi-xxv.

[87] Floyd Allport, *op. cit.*, pp. 49-82; cf. John B. Watson, *Behaviorism* (New York, 1925), pp. 120-123; Phyllis Blanchard, *The Child and Society* (New York, 1928), chap. i.

[88] V. Bechterev, *General Principles of Reflexology* (London, 1933), p. 45; George A. Lundberg, "Public Opinion from a Behavioristic Viewpoint," *American Journal of Sociology*, XXXVI (1930), 387-395, esp. pp. 390-395.

[89] Cf. E. B. Holt, *The Freudian Wish*, p. 58; cf. pp. 67-68.

[90] For a detailed analysis of creative imagination, see chaps. iii-iv.

12. Wholeness of vision (ability to see wholes rather than a mass of unrelated data) is a prime prerequisite of creative activity. The complete creative process begins in the scientist with this synoptic vision, with the perception of configurations of data, and, as we shall detail the process in Chapter III, continues through analysis and leads to insight into relations of data not previously discerned. This insight results in the reintegration of the original configurations through the synthesis of old and newly discovered components into new and enriched Gestalten. Reason in its creative aspect enters into the process as it acts in the analysis of the data already present together, making comparisons, seeking new relations, and leading to insight. In the process of negative criticism, reason lays bare contradictions and insufficient explanations.

13. In either physical or social science, the ability to perceive new relations and processes will depend upon the intimate participation of the investigator as a part of the total situation which he is studying; but this is more especially true of the realm of social relations, where men have come to know others through participation in various associations with them—a participation which depends upon and has grown with the enlargement of communication. On this account, in the social sciences imagination assumes one aspect hardly available to the research student in the physical sciences. This unique aspect is sympathetic imagination, or dramatic insight, by which contact is made between minds and by which the student of social reality gains insight into the subjective aspects of personality, culture, group life, and society at large; "a dramatic vision by which we can see how the agents now operating must interact upon one another and issue in a new situation."[91]

Later chapters will further analyze this process of growth in social knowledge. What needs to be stressed at this point is the fact that the exercise of dramatic insight in social science is not a barrier, as some might think, to the attainment of objectivity but is the pathway to it. Dramatic insight does not come out of detached objectivity. It comes out of social participation; and really scientific objectivity in the realm of human relations has gradually developed out of dramatic insight.

14. In both physical and social science objectivity is not possible without controls for the imagination, which has more often run wild than it

[91] Charles Horton Cooley, *The Social Process* (New York, 1918), p. 395; in this connection, Cooley also makes the principle applicable to agents operating in a physical situation; cf. C. Lloyd Morgan, *The Animal Mind*, chap. ii.

has been subjected to control. It has invented all the evil spirits, witches, devils, hedonistic heavens, and materialistic hells that have ever been conceived. Comte believed that the growth of science was in direct proportion to the growth of control over imagination, which is still unreined in the psychotic, the animist, the fantasy of the daydreamer, and in the particularist who attempts unilinear or atomistic explanations of all phenomena. It has not always gone unreined, however. No progress could have been made, in fact, if imagination had not been controlled by much close observation. Neither could any progress have ever taken place if the species had waited to test every hypothesis by quantification. The best that can be done to quantify data today in many cases is to be content with mere indicia. We cannot, however, be too energetic in the development of control techniques. But embracing and penetrating imagination owes its insight to its scope and limits its scope by insight, analytical, and critical reason, and the observation of data; and it controls observation and measurement as much as it is controlled by observation and measurement.

15. Historically, objectivity in the science of social relations has lagged far behind objectivity in the physical sciences; but, if we may believe Levy-Bruhl, primitive man was not given to objectivity in either the physical or the social realm; for he inferred from his comparative method of study that early preliterates had little capacity to distinguish between thought and emotion, subject and object, perceiver and perceived.[92] The savage, therefore, lived submerged in a mystic unity with his group, with physical nature, with the flora and fauna, with his totem and his tools—in short, with everything about him. Because he could not distinguish shadow from substance, dream from fact, hallucination from reality, personality from name, or an object from its emotionally conditioned "collective representation," the primitive man lived by a "law of participation" in a mystic identity with other things, imagining himself, for example, as being himself, a leaf, a wolf, or another person all at the same time.[93]

Professor J. E. Boodin believes that Levy-Bruhl's theory of primitive mentality exaggerates the distinction between the "native" and the modern occidental mind, which, he says, likewise unconsciously accepts its fundamental contradictions. He points out that the racial myth, ego-identifica-

[92] L. Levy-Bruhl, *How Natives Think*, trans. Lilian Clare (New York, 1925), chaps. ii-iii; cf. Levy-Bruhl, *Primitive Mentality*, trans. Lilian Clare (New York, 1923), pp. 29-33.
[93] *Ibid.*, pp. 82-91.

tion with the state, the flag, the cross, the Eucharist are found in the modern mind, and that "mystical participation is not limited in any case to savage societies, nor does this psychology offer any peculiarities."[94]

Of course, lack of objectivity has been a great barrier to the progress of knowledge in physical science, as is demonstrated by the opposition given by men of science to their fellow scientists; but the degree to which this deficiency clouds the minds of men who otherwise could be creative intellects in social science is surprising. Today the capitalist investigator establishes a science of capitalism, while the Communist does the same thing for communism. The Nordic struts and "offers his biceps to be felt" and "his chest to be thumped" as the Ajax of civilization; and the imperialistic exploiters of "backward peoples" get "scientific" backing from subjectively participant Karl Pearsons as they feel that they "should go and completely drive out the inferior race!"[95]

There is no lack of subject-object distinctions here in so far as in-groups and out-groups are concerned, but there is still a fallacy pointed out by Piaget as a mistake of the child, who is conscious of the object but not at all of the subject, so that he measures all things and pronounces them useless or useful, good or bad, without even so much as dreaming that the measurer is himself an object to be measured.[96]

The achievement of objectivity is essential to the development of creative personality; but objectivity cannot take the place of insightful behavior, of creative thought and imagination.

16. The only way we shall ever achieve objectivity in social science, and in the social world in general, *is not merely by piling up statistics, as indispensable as statistics are,* but by the cultivation of social imagination; of the ability "to perceive the drama of life more adequately than can be done by ordinary observation";[97] of the capacity in social scientists to participate in a group made up "of various sorts of synthetic minds; artists, scientists, philosophers, and men of action. . . . The constructive part of science is, in truth, a form of art."[98]

17. When a person has achieved objectivity and has become well acquainted with the data in a given field of his culture, he is in a position to enrich that field, *if he has the requisite imagination.* To be objective,

[94] J. E. Boodin, "The Law of Social Participation," *American Journal of Sociology,* XXVII (1921), XXXVII (1922), 30.

[95] P. A. Sorokin, *Contemporary Sociological Theories,* pp. 260-261.

[96] Jean Piaget, *Language and Thought in the Child* (New York, 1928), pp. 196-197.

[97] C. H. Cooley, *op. cit.,* p. 403. [98] *Ibid.,* p. 404.

however, he must have the social imagination to work with other scientists, must have become freed from group pressure, mind-binding habit, erroneous tradition, and the corruptions of vested interests. That the innovator and the scientist will never be able to outrun the social process, to act independent of the laws of social change, or to bring in a new world irrespective of the force of tradition, of culture, will surely be plain enough to those who can learn from the fate of Utopias, the prohibition amendment, the Briand pact, and the Treaty of Versailles. It is going to be very difficult to have *Union Now.*[99] To free the human mind, however, to work within and use, rather than to attempt to defy, the laws of social growth, is to stay in the road in which all things are possible to man—even the achievement of a society of the nations in which there will prevail two characteristics which are often thought to be contradictory: a democratic society without the philosophy of laissez faire and with the philosophy of planned controls.

[99] Clarence K. Streit, *Union Now* (New York, 1938)

CHAPTER III

CULTURAL FACTORS IN SCIENTIFIC CONCEPTS AND METHODS

"Science is contrasted with dogma in that it is ready to make its presuppositions the object of criticism and, if necessary, to revise them. It is not the lack of presuppositions that is the characteristic thing of science, but the self-criticism to which its principles may be subjected."—Barth Landheer

"$CH_3C_6H_2(NO_2)_3Hg(CNO)_2$ = well, what? An enormous hole in the ground, a pile of masonry, some bits of flesh and mucus, a foot, with the boot still on it, flying through the air and landing, flop, in the middle of the geraniums—the scarlet ones, such a splendid show that summer!"—Aldous Huxley

"By profession he [Helmholtz Watson] was a lecturer at the College of Emotional Engineering (Department of Writing) and in the intervals of his educational activities, a working Emotional Engineer. He . . . composed feely scenarios, and had the happiest knack for slogans and hypnopaedic rhymes."—Aldous Huxley

I. INTRODUCTORY

WE HAVE SEEN that the development of science manifestly has been a part of the social process in which the scientific investigator, or discoverer, has been the dynamic point of convergence for the interplay of psychological and cultural factors in the initiation of new traits and ideas. We have also observed that the cultural factors influencing the scientist have been: (1) the elemental data necessary to multi-combinations that take place in either technological or social discoveries or inventions; (2) the hampering factor of stubborn errors that have developed and persisted in various aspects of culture; (3) the "major premise" of the "cultural mentality" out of which emerge the philosophical and methodological assumptions underlying all scientific method; and (4) the cultural definition of goal values that make certain inquiries seem worth or not worth pursuing.

Any one of these factors, if given adequate treatment, would require much time and space. Hence, in this chapter, we shall limit our attention, largely, to the third factor and study the cultural configurations out of which emerge the concepts, assumptions, and methods of science.

II. THEORIES OF VARIATIONS IN THE HISTORIC CONFIGURATIONS OF CULTURE

As everyone knows, Comte thought that the human mind has followed definite stages in its development.[1] The first was the theological; the second, the metaphysical; and the third, the positive. The theological, or the original stage of mentality, regarded all phenomena of land, sea, or sky as being governed by the will of indwelling beings, possessed of life, intelligence, purpose, but not at all by invariable laws of sequence. Originally man looked upon individual objects as animated, but, as this first or theological mentality developed, his conception changed to invisible beings, each of whom governs, not one object or event, but a whole class of objects or events; that is, he moved from fetishism to polytheism. The latter attitude, then, evolved into the conception of one God as Creator of the whole universe, the total activities of which are the continuous action of God; or at least the activities of which the Creator modifies from time to time.

The metaphysical mind "accounts for phenomena by ascribing them, not to volitions either sublunary or celestial"; not to a god that causes and directs the forces of nature, but to a force "inherent in but distinct from the concrete bodies in which they reside." In this stage there arise such concepts as "vegetative soul," then "plastic force" or "vital principle."[2] Nature becomes impersonal and yet it is ruled by indwelling tendencies.

The metaphysical stage, Comte believed, was only transitional, an intermediate stage lasting through the revolutionary epoch and giving way to the positive attitude. The positive philosophy assumes that, in that part of the universe known to us, the direct determinants of every phenomenon are not supernatural but natural.

Though Comte did not believe that the theological, metaphysical, or positive mentality prevailed exclusively at any given time in human history, he did say flatly that "all our speculations on every subject of human inquiry are bound to pass successively, both in the individual and the race, through these different theoretical states, usually known as the Theological, Metaphysical, and Positive."[3]

[1] Auguste Comte, *Positive Philosophy*, trans. Harriet Martineau (2 vols.; London, 1893), Vol. I, "Introduction" and chap. i.

[2] J. S. Mill, *The Positive Philosophy of Auguste Comte* (Boston, 1871), pp. 11-30.

[3] See G. H. Lewes, *History of Philosophy* (2 vols.; London, 1867), II, 616, for the first part of the statement, and A. Comte, *Discourse on the Positive Spirit*, trans. E. S. Beesley (London, 1902), p. 2, for the latter part.

Contrary to a frequent impression, Comte held that "the theological manner of philosophizing" was "for a long time not only inevitable but indispensable to progress,"[4] since the positive spirit was quite unsuited to the infancy of humanity. True enough, the rise of positive philosophy is subordinating imagination to observation as

> . . . the first fundamental condition of all sound scientific speculation . . . [but] science really consists in the laws of phenomena. Facts themselves . . . however exact and numerous they may be, can only furnish the indispensable materials of science. . . . True science, far from consisting of bare observations, always tends to dispense as much as possible with direct exploration, and to substitute for it that rational prevision which is, in all respects, the principal characteristic of the Positive Spirit. . . .[5]

Not only do the race and the individual move through the three modes of thought, but each science likewise begins with the theological attitude and ends with positivism. Comte had really a remarkable conception of a scale of subordination of the sciences, the scale being the order of the logical dependence of those which follow on those which precede. This fact, rather than the theory of the order in which the sciences became positivistic, is, at this point, the important one. For Comte saw what many scientists today apparently do not see; namely, that each succeeding science, especially in the case of biology and of sociology, depends not only on the data of preceding sciences but also on its own data in addition. Thus he arranged the sciences in a hierarchy or pyramid with mathematics at the base, and astronomy, physics, chemistry, biology, and sociology ascending in order.[6]

Comte helped to pave the way for a scientific understanding of the social process. But Sorokin contends that there has been no such unilinear evolution of the "empirical truth of the senses at the expense of a progressively declining truth of faith or the truth of reason" as Comte believed has occurred. The hundreds of thinkers who have repeated "the formulas of Turgot, Condorcet, Auguste Comte, Saint-Simon, particularly that of Comte—that in the course of time mankind as a whole passes from the theological to the metaphysical and then to the positive stage of its mentality"—have been wrong. Sorokin believes, after extensive

[4] A. Comte, *op. cit.*, I, 24-25.

[5] *Loc. cit.*; cf. *Positive Philosophy*, Bk. VI, chap. iii.

[6] G. H. Lewes, *op. cit.*, II, 604, has a brief, but complete, outline of this hierarchy; Comte, *Positive Philosophy*, Vol. I, "Introduction," chap. ii.

investigation of fluctuations in systems of truth and knowledge, that the changes in the last twenty-five hundred years have not been progressive but trendless. He admits that, during the last five centuries, the "truth of the senses has been rising rapidly," but he thinks that the fluctuations may, possibly, indicate trendlessness in the future.[7]

III. CULTURAL CONFIGURATION AND METHODOLOGICAL ASSUMPTIONS

Without debating the relative merits of various theories of the evolution of "cultural mentality," and without starting out in defense of all aspects of the general thesis of Sorokin, which is not our purpose, and with full knowledge of the fact that Comte was often in error, it is quite possible to find valuable suggestions in both writers as to the influence of "world-pictures" as philosophical forces organizing cultural configurations out of which the conceptual and methodological assumptions of science grow. Sorokin, for example, holds that the interrelations of the various aspects of a culture can be interpreted only through a "logico-meaningful method," by which, after one has discovered the "major premise" of a given milieu, he can see how all aspects of the cultural mentality of a people flow out of that major premise in their culture. He classifies cultures as sensate, ideational, and idealistic, or mixed, and contends, as indicated above, that cultures have moved, again and again, with trendless fluctuations through these various types, each aspect of the culture, science, religion, art, etc., seeming, logically, to change with and to take its meaning from a sensate, ideational, or idealistic world-picture, which he calls a major premise.[8]

Thus, in a sensate culture, Sorokin finds a different subject matter and methods of validation in sciences from those of an ideational or idealistic type. He further discovers a corresponding fluctuation in scientific discoveries and technological inventions, shifts from idealism to materialism, from eternalistic to temporalistic attitudes, from realism to nominalism, from universalism to singularism, from indeterminism to determinism, from holism to atomism, from vitalism to mechanism, from one theory of light to another, and so on.[9] If the major premise of the world-picture changes, the entire configuration of which it is the organizing principle changes in a "logico-meaningful" way; and Sorokin says that the change is reflected in the individual scientist in the following manner:

[7] P. A. Sorokin, *Social and Cultural Dynamics* (4 vols.; New York, 1937), II, 30-33, esp.; also I, 186-189. [8] *Ibid.*, I, chap. ii. [9] *Ibid.*, II, chaps. iv-vii.

Every scientist and scholar has some sort of philosophy—whether his assumptions in this respect are explicit or implicit, whether his position is adopted advisedly or whether, as Molière's hero, he talks prose without being aware of it. Likewise, the total philosophico-scientific mentality of the various culture periods studied have invariably involved some sort of "first principles" basic to the complex "superstructure" of the numerous scientific and philosophical theories of the time. . . . Without such a framework no systematization, classification, or even apprehension of the facts would have been possible. Clearly, some such first principles must be assumed if the more detailed theories in various fields are to be coherently organized.[10]

At this point someone may ask whether such varying basic assumptions as are conceded to exist in the mentality of contemporaries to be discussed in the succeeding pages support the idea of Sorokin that scientific assumptions grow out of a general cultural mentality. It may be at once answered that, in Sorokin's viewpoint, a complete cultural determinism is not implied. That there is always a minority party in any age and that leading conflicting ideas struggle for supremacy is very clear. That any man's philosophy is the resultant of all the psychological and cultural forces impinging upon him and working through him in complex interplay is also just as clear as in the case of the scientific achievements; and the extent to which different traditions existing in the same general cultural epoch play upon contemporary scientists and philosophers to place them in opposite schools will be clearly seen in the chapters on Galileo Galilei, Charles Robert Darwin, and Auguste Comte. There also we shall see that psychological factors, even emotional (likes and dislikes), have an important part, as in Comte's refusal to give credit for any part of his positive philosophy to Saint-Simon.[11] Yet, with all these facts clearly in view, we must still recognize much that is valid in the general hypothesis of Sorokin.

Surely, the work of Comte and Sorokin should have awakened everyone to the influence of assumptions as basic to a science and to the influence of the cultural configuration upon these assumptions; but many who have tried to be ultra-Comtean by denying that they have been influenced by theology or metaphysics have been the most dogmatic and metaphysical of the lot. Indeed, the assumptions of the other man are always easier

[10] *Ibid.*, II, 181-182.

[11] Richmond Laurin Hawkins, *Auguste Comte and the United States* (Cambridge, 1936), pp. 113-118. It is interesting to note the Comtean influence flowing in certain directions and not in others in the United States. How did Comte get in touch with George Frederick Holmes and not with many others?

to see than our own, which is another consequence of the childish fallacy of the unmeasured measurer suggested by Piaget and carried over from the "pre-logical" mentality attributed to primitive man by Levy-Bruhl. To illustrate, a contemporary writer who is usually irenic forgets to be gracious as he criticizes others of whose assumptions he complains. While stating his own metaphysics as scientifically established facts, he says:

> The prior development of the environmental sciences has been of great aid in the development toward an exact and objective science of personality and behavior. More and more the attempt to reduce behavior to physico-chemical and psycho-social processes has been successful. The spiritualists and the theologians and the metaphysicians have not welcomed this growth of a science of personality and they have not hesitated to reveal their intellectual character by their strenuous efforts to sweep back the oncoming tide of behaviorism with their witch brooms on which they are wont to ride in the clouds of spiritistic phantasy. But, in spite of this bit of diverting hobby-horse play, a science of personality based on a measurable mechanics of behavior is bound to replace the old magical and mystical spiritism which still survives in the thousand and one cults that delight in calling themselves psychological.[12]

What the author quoted delights to do, likewise, is to call his works psychological, and we may readily grant him that privilege; but, of course, the term "cult" each of us, with a psychology, reserves for the thousand other brands of psychology. As for metaphysical assumptions, they not only form the substrate of the sciences of psychology and sociology, but were present in the "prior development of the environmental sciences." We may, therefore, turn to: (1) the philosophical backgrounds out of which emerge the student's conception of his field, whatever it is, the nature of the data in it, and its relation to other fields; (2) the influence of his basic philosophy on his theory of causation; and (3) the manner in which his theory of what constitutes lawful behavior will determine what phenomena he will consider subject to scientific investigation.

IV. PHILOSOPHICAL BACKGROUNDS OF DATA AND FIELD

Every scientist, as Sorokin suggests, may be placed in his view of reality somewhere between the most extreme forms of idealism and materialism. If he is an idealist, his idealism may be either monistic or pluralistic. If monistic, he thinks of one all-embracing spiritual or psychical reality back of all the manifestations of nature. If pluralistic, he con-

[12] L. L. Bernard (ed.), *The Fields and Methods of Sociology* (New York, 1934), p. 5.

tends that a plurality of souls or spirits make up the ultimate and the real. If he is a materialist, he may be a pan-psychist or a mechanist. In either case, for him the ultimate reality is matter, of which any spiritual phenomenon is a manifestation. If he is a pan-psychist or hylozoist, he sees life as an aspect of matter and identifies matter and life in a sort of materialistic-pan-psychic monism. If he is a mechanist, he holds that matter is the only reality and that all immaterial phenomena are, in so far as they exist, "a purely passive product of matter and of purely mechanistic motions of material particles."[13]

In a sensate culture, materialism reigns, and the ultimate datum is the system of the atom, although it may no longer be considered a "Democritean billiard ball"; but if sensate ultimates begin to decay, "Eddington and Jeans," e.g., "from 1928 on, do not hesitate to refer to atoms as symbolic conceptions"; ". . . a schedule of pointer readings. . . ."[14] In biology, also, in a sensate culture, the atomic theory holds and mechanism ousts vitalism, but vitalism comes back in as the sensate culture decays.

For either the materialist or the idealist of an extreme type there is but one level of reality, and the true nature of scientific data can be seen only on that level. In fact, the concept of reality one holds will determine his concept of the unity or plurality of science and of the relation of his particular field to other fields. Some students say there is a separate science for each level of reality, while others, whatever their field, affirm that there is only one level of reality and that, therefore, there must be a unity of science.

The biologist J. A. Thompson envisions a plurality of sciences: the science of a physical order, in which mechanism reigns supreme; the science of animate order, in which mechanism is transcended; and the science of psychic order, where mechanism is irrelevant.[15] A. L. Kroeber, as an anthropologist, holds that there are four kinds of phenomena, calling for as many sciences: (1) the phenomena of matter and of force as such; (2) of life as such; (3) of consciousness; and (4) of social life or culture. These bodies of phenomena provide the data, the phases of reality, for physical science, biological science, psychological science, and social science respectively.[16]

[13] *Op. cit.*, II, 183. [14] *Ibid.*, II, 445.

[15] J. A. Thompson, "Is There One Science of Nature?" *Hibbert Journal*, X (1912), 308-327.

[16] A. L. Kroeber, "The Possibility of a Social Psychology," *American Journal of*

As an example from the field of philosophy, we have the conflicting viewpoints of Henri Bergson and C. Lloyd Morgan growing out of the differences between the theories of creative and emergent evolution. Bergson's theory depends upon vitalism; that is, he believed that the inert and the vital-and-the-conscious are separate orders of reality, in which changes proceed side by side in the evolutionary process. The vital-and-the-conscious, Morgan holds, emerged as new multi-combinations in evolution, proceeding as the same order of reality throughout. Therefore, he says there is but one science of nature, while Bergson must contend for two.[17] However, when he analyzes his position, it really calls for, and he accepts, science at work with distinctive data on different levels of this evolving order of reality; for he says:

> The thesis I seek to develop is that there is one science of nature—that which includes all kinds of relationships. But, of course, *this* one science of nature must not be so defined at the outset as to limit it to physico-chemical relationships and to exclude all that is distinctly organic. Professor Thompson includes under biology certain phenomena in connection with animal behavior which involve experiential relationships. That these phenomena cannot adequately be interpreted in terms of precise physico-chemical descriptions, and in these terms only, is, for me, so true as to be a truism.[18]

When we turn to the fields of economics and sociology, we find a divergence of opinions. Jacques Rueff holds that there is but one science of nature, which is measurement, precise and exact. Physics, chemistry, ethics, economics, and politics are equally measurable. Differences between the physical and the social sciences do not exist, except for the fact that social systems may possibly rise and decay more rapidly and in greater numbers than do physical systems taken as wholes. In both physical and social systems, however, laws are eternal. They existed as principles of organization before an actual organization arose as in the case of a steam engine, a symphony, or a state. The laws of these organizations are eternal, but not always in operation. They operate only as long as the universes or systems to which they are appropriate exist and no longer. Physical systems come and go, and, with them, the observability of the laws that organize them. The laws of chemistry operate in our consciousness as such until the time may arrive when a different chemi-

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Sociology, XXIII (1918), 634-635; cf. C. M. Perry, *A Multidimensional Society* (Norman, 1940), pp. 7-17.

[17] *Instinct and Experience*, pp. 145, 159. [18] *Ibid.*, p. 159.

cal universe arises. Any workable system we can imagine has its definite or measurable laws, whether it ever comes into existence or not. There is something in the rules of systems which we have not created in our minds, but if our rational ego were different, the scientific image of our world would be different.

In social systems such as capitalism and communism, the principles are eternal, even if the concrete systems come and go. In the present state of life, such and such circumstances are present, and such and such laws, as a sequence of events to be expected under the existing system, permit us to foretell phenomena as future links in the sequential chain. "And if," says Rueff, "in the course of the evolution of our world, certain circumstances should cease to be present, the laws permitting us to deduce therefrom the resulting phenomena would certainly cease to apply. They would no longer have any current reality but they would be none the less true."[19]

Rueff knows no law of innovation except that, for him, the ongoing forces of life, whatever they may be, bring in new systems and make obsolete the present orders of being. He seems to be not only an agnostic as to the ground of reality and its processual methods but to confuse the mental analysis of universes or systems with these systems themselves, in spite of the fact that he states that there is something to rules independent of the perceiving mind. Science is one for him only because it is no more than method. He shows how exact we can be in a capitalistic political economy by the most involved kind of statistics, with which he covers page after page and which, he admits, are of little interest to any except the well initiated, who, by the way, must be well groomed in Rueff's particular system, too.[20] He argues, however, that his exact science of political economy, framed for a capitalistic society, does not apply in Russia.[21] To ask how innovations come about is, as he sees it, a metaphysical heresy of which no scientist should be guilty. Once more, an attempt—a most metaphysical attempt, which knows enough about the "on-going forces of life" to know that we can know nothing about them —shuts out of a student's field of study all consideration of the cultural process and the factors that enter into it.

T. Swann Harding, as a physical scientist turned sociologist, follows

[19] Jacques Rueff, *From the Physical to the Social Sciences*, trans. Herman Green (Baltimore, 1929), pp. 67-68, ix-xxxiii.

[20] *Ibid.*, pp. 67-68.

[21] *Loc. cit.*

Rueff's position without mentioning him, when he writes to the effect that you can have a science called socialism which would not apply to present-day half-capitalistic conditions; yet its laws are at present true but inoperative, just as the laws governing steam engines were true before there were any steam engines. He again approaches Rueff when he holds that the Phlogiston theory in chemistry remained true until so many facts contradicted it that it became inconvenient to let it operate any more. For him, therefore, the one science is (1) the observation of present systems and (2) the rational process of creating causes.[22] Again this position seems to be one in which a confusion exists between causes actually operative in a system of events and a theory of those causes.

A majority of the sociologists would agree with J. A. Thompson and A. L. Kroeber that each level of reality has its own distinctive type of science. They would hold that Morgan's "emergents" do constitute different phases of reality and thereby different fields of knowledge demanding unique methods or aspects of method that are unique. William Dilthey,[23] for example, claimed that the natural sciences "treat that which is forever foreign to us," while the mental sciences are concerned with material immediately available to us through empathy. And every social scientist is familiar with Charles Horton Cooley's definition of social knowledge as knowledge that is developed from contact with the minds of others through communication, which arouses in us the same processes of thought and sentiment as are going on in those whom we would understand and enables us to understand them by sharing their states of mind.[24] He thus identifies social with what he calls personal against spatial knowledge. Physical knowledge, which the physical scientists seek, is mensurable; but the clearly distinctive trait of social knowledge is its dramatic quality, your own personality re-enacting imaginatively what is thought and felt in others as you observe their behavior in the light of their present and past situations and of your past experiences in what you take to be similar situations. But J. F. Markey denies that there is any difference between spatial and social knowledge, claiming that one's knowledge of a tree is not different from one's knowledge of a man.

[22] T. Swann Harding, "All Science is One," *American Journal of Sociology*, XLI (1936), 492-498.

[23] Franz Oppenheimer, "History and Sociology," in W. F. Ogburn and A. Goldenweiser, *The Social Sciences and Their Interrelations* (New York, 1927), p. 224.

[24] Charles Horton Cooley, "The Roots of Social Knowledge," *Sociological Theory and Social Research* (New York, 1930).

Accusing Cooley of polishing glass, he says, "We get to know people through the senses (rather through all our responses, including those of the sense organs) and socially interchangeable stimuli," just as we come to know things by the same process. For him man is but an organization of responses, capable of developing only stimuli, which in turn elicit more responses. Experience itself, overt activities, sensations, habits, and inventive activity are all responses. We observe with our responses, including those of our muscles, glands, viscera, and other apparatus.[25]

C. A. Ellwood joins Cooley rather than the critics of the latter, because of the intermental nature of society; because of the nonmaterial aspects of culture, the nature of the social process, the nature of adult human behavior as essentially cultural, and the nature of human institutions as being based upon values and valuing processes. Like Cooley, he feels that "much would-be social science seeks to dodge the mental and emotional processes in which society consists . . . [but] in the end it will not work; these phenomena are natural; there is no substitute; if we are to have a science, we must advance through them, not around them";[26] and, in a response to L. L. Bernard, he writes:

> Even if we accept the philosophical view that "all is natural," I do not see how this helps us determine the validity of generally accepted natural science methods in the field of the social sciences. If the facts that the social sciences deal with *are unique,* and not to be found in the rest of nature, then we will have to have special methods to deal with them. The distinction between the sciences of nature and the sciences of culture will remain. To include culture in nature is surely too cheap a way to settle the methodological problem involved in the handling of human social facts. . . . The facts dealt with by the sciences of culture have no analogue in the rest of nature, and as they make the sciences of culture different, the latter require different methods. That is all that I attempted to show.[27]

And, with reference to the same point, Howard E. Jensen concludes:

> First, cultural phenomena cannot be analyzed and described without reference to meaning, which implies conscious states; second, they cannot be explained without reference to purpose, which involves a consideration of ends; third, they cannot be predicted, except in terms of crude probabilities, without reference to values; and fourth, they cannot be controlled without

[25] J. F. Markey, "Trends in Social Psychology," in G. A. Lundberg, Nels Anderson, and Read Bain, *Trends in American Sociology* (New York, 1929), pp. 139-148.

[26] *Methods in Sociology,* p. 58, quoting Professor Cooley, *Life and the Student,* p. 154.

[27] C. A. Ellwood, "Rejoinder" to L. L. Bernard, "The Great Controversy, or Both Heterodoxy and Orthodoxy in Sociology Unmasked," *Social Forces,* XIV (1935), 64-72.

reference to motives, both of which require insight into impulses, wishes, attitudes, and desires. Contrary to the natural science viewpoint, which determines what cultural problems are available for research by their amenability to certain methodological principles, it is here proposed to let cultural problems themselves determine what methodological principles and procedures we must employ.[28]

IV. THE INFLUENCE OF THE CULTURAL CONFIGURATION ON THEORIES OF CAUSATION

As to the influence of culture on theories of causation, we at once see the changes that have taken place in the social process. Manaism and animism were sufficient causal explanation for the preliterates. Of course, the mechanistic determinist of the present would affirm that any other than his theory of causation would have to depend upon sheer chance or on good old-fashioned animism. In what periods have "animism" and "determinism" prevailed?

Sorokin gives a table of indices for determinism and indeterminism over a period of twenty-five hundred years, beginning with 580 B.C., which shows that determinism was more than three times as prominent as indeterminism up to A.D. 100; that from this time until A.D. 540, indeterminism predominated over determinism as two over one; that thenceforward to A.D. 1500 indeterminism was to its opposing philosophy as seven to one, from which time until now, their weight has been, with many interim fluctuations, about even.[29]

With these fluctuations in the philosophy of determinism, indeterminism, and their mergers, theories of causality and of causation in science have changed in spite of the fact that, when a new phenomenon occurs, every scientist must ask the same question; that is, "What is the disturbing factor?" If there are new factors attended by new consequences which may be related, he wants to know how the observed series are related. In that respect, the determinist of the sensate culture and the indeterminist of the supersensory culture are alike in all ages; the determinist holding to the concept of universal, necessary, and invariable relations between correlated series of phenomena, and the indeterminist holding that a causal series is "potentially variable."

The scientist with a mechanistic view, once he has arrived at it, is not apt to interpret data or phenomena as fitting into any other than a mechanistic system, regardless of how they may appear to the vitalist, the

[28] In *Methods in Sociology*, p. xvii. [29] Sorokin, *op. cit.*, II, 342-345.

holist, or proponent of other world systems—and so in the case of others as well as the mechanist.

Here may be considered as instances the positions of Huxley and Haeckel.[30] J. A. Thompson recalls the former's "famous statement of his radical mechanism" to the effect that, if evolution be true, a beholder of the first primitive nebulosity knowing its laws, could have predicted from the molecules of that vapor the state of the fauna in Great Britain in 1888. Huxley thus denies any "creative individuality of organisms which trade with time in a spontaneous and unpredictable way all their own."[31] Their behavior is predetermined in those first molecules.

Such predeterminism would leave a man no alternative but to "refer to his brother or his cat as an ingenious mechanism."[32] Furthermore, in such a world, the man of research would have to do what he was predetermined to do and make whatever causal explanations of present-day phenomena that were wrapped up in the bosoms of those first molecules, regardless of how many contradictions or opposite views scientists may hold today in accounting for any natural phenomenon.

E. G. Conklin's philosophical view of the difference between determinism and predeterminism leads to a different result.[33] For him determinism is only orderly causation entirely compatible with Jensen's view of mechanism and purpose, while predeterminism leaves no chance for the efficacy of human purpose as a factor in the causation of behavior. As Jensen puts it:

> Both mechanism and purpose are causal and orderly. The orderliness of mechanism consists in the uniformity with which events succeed one another in time as cause and effect, and the orderliness of purpose consists in the adequacy with which means are adapted to circumstances in the attainment of chosen and desired ends.[34]

If the scientist holds that correlation is causation, he does so simply because he makes no attempt to answer either the question Why? or How?, the latter, of course, being ordinarily considered the scientist's

[30] Strangely, Haeckel's mechanistic philosophy can best be understood in the light of his tender love letters; a fact which indicates the strong interactive force of emotional, intellectual, and cultural factors in the conclusions of philosophers and scientists. See E. H. Haeckel, *Love Letters, Written Between 1898 and 1903*, trans. Ida Zeitlin (New York, 1903).

[31] J. A. Thompson, *op. cit.*, p. 322.

[32] Howard E. Jensen, "Introduction," in C. A. Ellwood, *Methods in Sociology* (Durham, 1933), p. xv.

[33] E. G. Conklin, *Heredity and Environment* (6th ed. rev.; Princeton, 1929), chap. vi.

[34] Howard E. Jensen, *op. cit.*, p. xxii.

question. If he accepts probability as the only law, it is because his philosophy visualizes a world much nearer a multiverse of chance than a mechanistic universe. Thus a philosophy of causation affects every step a scientist in any field takes in "reaching the conclusions he already has." And note again how his philosophy of causation and his view of the relations of the physical and social sciences are co-implicated. Morris Cohen writes:

> Let us take a concrete example. A man says to a woman, "My dear!" The physical stimulus is here a very definite set of sound waves, and we have reason to believe that the physical effect of those waves is always determinate. But what the lady will in all cases say and do in response depends upon so many factors that only an astonishing complacency about our limited knowledge of human affairs would prompt a confident answer. The a priori argument that there must be laws is based on the assumption that there are a finite number of elements or forms which must thus repeat themselves in an endless temporal series. But why may not the repeatable forms and elements be only those which enter our physical laws? What guarantee is there that in the limited time open to us there must be a complete repetition of social patterns as well?
>
> In any case, those who think that social science has been as successful as physical science in discovering and establishing laws, may be invited to compile a list of such laws and to compare the list in respect to number, definiteness, and universal demonstrability with a collection such as *Northrup's Laws of Nature*.[35]

VI. CONCEPTS OF THE LAWFUL AND THE KNOWABLE AS DETERMINING SUBJECT MATTER AND METHOD IN SCIENCE

It is clear that the mechanistic determinist cannot admit the phenomena of consciousness as subject to scientific investigation, since, for him, they have no place in a sequence of causes; but what demands attention in this section is not further consideration of this principle of exclusion as such but an analysis of the manner in which the investigator's conception of the lawful and the knowable influences his idea of subject matter and method in science.

Of particular interest at this point is the methodological result of the differences between the followers of Aristotle and of Galileo Galilei in their views of natural law, and between either of these and the devotees of descriptive science, who, for the most part, we may think of as belong-

[35] Morris Cohen, in Ogburn and Goldenweiser, *op. cit.*, chap. xxxiii; cf. K. D. Har, *Social Laws* (Chapel Hill, 1930).

ing to the tradition of Francis Bacon, David Hume, and Karl Pearson. Kurt Lewin says that the Aristotelian, the Descriptive, and the Galileian constitute three successive epochs in the history of psychology; and he outlines them, in part, as follows:

LAWFULNESS AND DYNAMIC CONCEPTS

Epoch	*I. Speculative Aristotelian*	*II. Descriptive*	*III. Constructive Galileian*
Goal	To discover the essence of things and the cause behind all occurrences	To collect as many facts as possible and to describe them exactly.	To discover laws. To predict individual cases.
General characteristics of concept formation	Friendly to theories (of a speculative type).	Hostile to theories.	Friendly to theories (of an empirical type).[30]
Nature of lawfulness	A law (equals) a rule. Individual case not lawful. Lawfulness only where there is a regularity of occurrences.		A law (is not equal to) a rule. All events are lawful including those which occur only once. An empirical proof that an event is lawful is not necessary.
The technique of proving a particular law	Demonstration of the frequency of similar events, disregarding individual differences. The rule is the more certain the greater the number of cases and the greater their similarity. "The exception proves the rule."		Investigation of individual "pure cases." Comparison of different cases (systematic variation); no abstraction from individual peculiarities. The validity of the proof depends upon the purity of the case and not upon the frequency of its occurrence. Experiment (equals) deliberate creation of pure cases.

[30] This is a part of the material found in Table 1 in *Topological Psychology* (New York, 1936), p. 9. The rest of the material is from Table 2, p. 10.

Logical properties of concept formation	Classification by factors (tendencies). The abstraction from differences (statistical averages). The concept of thing predominates.	Classification according to phenotype	Concept formation through construction (as opposed to classification). . . . The concept of event predominates; functional, conditional-genetic concepts.
Dynamics	Causes are directed factors (tendencies). The essence (general class) of the thing itself is the cause of its behavior. The behavior is determined by the past or the future (teleology).		Causes are directed factors. Only relations between several facts can be cause of events. Every event depends upon the *totality* of the contemporary situation.[37]

Lewin says that the goal of the Aristotelian epoch was "to discover the essence of things and the causes behind all appearances"; of the descriptive epoch, "to collect as many facts as possible and to describe them exactly"; and of the constructive Galileian epoch, "to discover laws, to predict individual cases."[38] He tells us that, for Aristotelians, the regular and the frequent occurrences were lawful, while cases occuring only once were chance occurrences; but, for Galileians, including Gestalt psychologists, any event, if it occurs only once, is as lawful as if it had occurred a million times.

For the Aristotelian and the descriptive epochs or schools of science, then, the subject matter, or at least the facts of science, was and is limited to what is regular or frequent, what can be classified, measured, or counted; but, for the Galileian scientist the subject matter of science is any event whatsoever, while the tendency of the descriptive scientist has been to limit his subject matter and his method very sharply by his conception of what is knowable through the senses.

Physics and chemistry may have passed through the Aristotelian and descriptive epochs and entered into the Galileian epoch of the conception of natural laws and of lawful behavior, but economics, education, psychology, sociology, and criminology have not, in general, entered that

[37] *Topological Psychology*, p. 10; cf. Kurt Lewin, *A Dynamic Theory of Personality*, trans. D. K. Adams and K. E. Zener (New York, 1935), chap. i.

[38] *Topological Psychology*, p. 9.

state.[39] They still decidedly feel the influence of such thinkers as Francis Bacon, David Hume, and Karl Pearson and hold fast to a science of description.

Karl Pearson, an example of a dynamic, trait-initiating transmitter of a tradition, was far from being either Aristotelian or Galileian in his viewpoints; but his influence on the present is, in a practical way, more like that of the former than of the latter; and his own mistakes, in real scientific practice, were like those of the former. For him the subject matter of science was as inclusive as the universe, *so far as it could be known by a "routine of perceptions."* However, he was not on the side of some of those who today still cry with Paul du Bois-Reymond,[40] "Ignorabimus"—"We shall be ignorant" of such and such facts because we know they can never be brought within the range of a "routine of perceptions" or sense impressions.[41] He thought, for instance, that, by inference, one man may know more about the consciousness-of-the-other, as a conscious being himself, than he may know about any physical object beyond the sense impressions he has of it.[42] Yet, for him, the only scientific facts were sensations,[43] and the only scientific law "a brief description in mental shorthand of as wide a range as possible of the sequences of our sense-impressions."[44]

Pearson held that "the universe is made up of innumerable entities, each probably individual, each probably non-permanent." All that man can achieve by way of science, then, "is to classify by measurement or observation of characteristics these entities into *like* classes," within which "variation can be noted." This being true, "the fundamental problem of science is to discover how the variation in one class is correlated with or contingent on the variation in another class."[45] All science must be based on classes of objects and events, everyone of which is unique, varying from a mythical average of its type on a normal distribution curve with an upper and lower limit of variation; but classes A and B can be compared only after the construction of contingency tables in which no two individuals of any class ever appear alike. What appears is A_1, A_2, A_3, A_4, A_5 and B_1, B_2, B_3, B_4, B_5; and what is compared is contingencies, which

[39] Nathaniel Cantor, *Crime and Society* (New York, 1939), p. 60.

[40] *Über die Grundlagen der Erkenntnis in den exacten Wissenschaften* (Tübingen, 1890), cited in Karl Pearson, *Grammar of Science* (3d ed.; New York, 1911), p. 21.

[41] *Grammar of Science*, p. 21.

[42] *Ibid.*, p. 51.

[43] *Ibid.*, p. 66.

[44] *Ibid.*, p. 112, and chaps. ii-iv.

[45] *Ibid.*, p. 165.

do or do not assume the nature of association on a scatter diagram, an association so close that it yields a high correlation.[46]

Science, then, is the correlation of two series of "routines of sense impressions"; the greater the number, the greater the probability of a law that holds good. Science can deal with none of these unique objects or events as such. It can have for its content only masses of data and for its method only correlation, which is also all it will claim as knowledge of causation.[47]

This tradition flows strongly through "the folkways of American sociology." Stuart A. Rice, as the editor of *Methods in Social Science*,[48] and as one who sees "any scientific inquiry" as "relative to the philosophy of the person pursuing it," states that his *Quantitative Methods in Politics*[49] "contains a philosophic argument designed to support the writer's underlying belief in the *essential unity of the universe and of the science which is gradually exhibiting it to view*."[50] Yet, we find him immediately maintaining that belief in the existence of any material thing is an inference, so that we have as much evidence of the social unit of a dance orchestra as we do of the existence of the saxophone. But, as someone has said in reply, the Chinese observer and the American would find themselves far more in agreement on the characteristics of the saxophone than they would upon the music produced by the orchestra in which the instrument is being played. Making it clear that he sets forth "no . . . contention for the fundamental similarity of reality in the social and the physical world," and asserting that he does "not know what psychic phenomena are . . . nor . . . material phenomena are, essentially, or how they differ," knowing only what his senses tell him, he maintains that scientific unity is to be found only in method, and that method is quantification.[51]

George A. Lundberg and Read Bain are also observers of the "folkways" flowing out of the descriptive tradition; for, as we shall see more fully later on, Lundberg contends that science is "invariably concerned with *uniformities* in large numbers of phenomena,"[52] and Read Bain affirms that "the only certainties transcending common sense in sociology or any other science are statistical in nature."[53]

[46] *Grammar of Science*, pp. 155-177.

[47] Pearson made no claim there is no *why* in sequences of phenomena, but that science deals only with the description of *how* they take place. See *ibid.*, p. 120.

[48] Chicago, 1931. [49] *Ibid.*, pp. 10-21. [50] *Ibid.*, p. 21.

[51] *Ibid.*, pp. 33-34. [52] *Social Research* (New York, 1929), p. 72.

[53] "Measurement in Sociology," *American Journal of Sociology*, XL (1935), 486.

The Galileian viewpoint, however, is in sharp contrast to the foregoing. It does not hold, with Pearson, that the "fundamental problem of science is to discover how the variation in one class is correlated with or contingent on the variation in another class." Its stress is on functional relations in total situations and not on variations in average "routines of perception." In sociology and psychology it is not shut up to the statistical approach. It is open to the clinical, case, or dynamic approach to the problems of individual personalities as evolving in unique situations the component elements of which may never be configurated again in the same manner. As Nathaniel Cantor puts it:

> In the living concrete world of men and women there are no actual "average" situations or "average" people or "average" behavior. "Average" is an abstract mathematical term which refers to the common factors abstracted from living situations and which ignores the vital unique differences which make the particular situation just what it is. The "average" number of children in the family of college graduates may be 1.8, but it would be an event of the years to see a cooing .8 child.[54]

Those who stress the total situation in causal explanation in criminal behavior, for example, want to know why so many delinquents and nondelinquents alike come from the same statistical classes—broken homes, unbroken homes, slum areas, feeble-minded, not-feeble-minded, poor, not-poor, educated, and uneducated. Why do delinquents and nondelinquents come from the same home?[55] Why from the same pair of twins? Why the personality differences in many cases of identical twins, for that matter?

With this functional view of causation, those in the Galileian tradition are in a position to use not only statistics but with consistency to make the clinical approach and appeal for data to case histories.

VII. SUMMARY AND CONCLUSION

In this chapter we have discussed: (1) some theories of variations in the historic configurations of culture; (2) the influence of the cultural configurations upon the philosophical and methodological assumptions of science; (3) the philosophical backgrounds out of which emerge the investigator's conception of his field; (4) the influence of the cultural configuration on theories of causation; and (5) concepts of the lawful and the knowable as determining the subject matter and the method in

[54] *Op. cit.*, pp. 59-69.

[55] Cf. Healy and Bronner, *New Light on Delinquency and Its Treatment* (New Haven, 1936), pp. 92-120.

science. And we conclude that science, in the main, is dominated by the predominant major premise of the time, or by the various more or less conflicting streams of contemporary traditions. If, however, the fluctuations described by Sorokin should go on forever, we may still agree with Barth Landheer that the kind of an assumption a scientist has is not what is necessarily fatal. The way to escape so much imaginal refraction in the cultural medium is pointed out by Landheer as he writes:

> The intellectual atmosphere in which a scientist works must be known before his conclusions can be accepted or even critized. It is no longer a question of whether or not the scientist is objective, but rather what his cultural perspective is. . . . Spranger has shown that it is the common elements in different universes of discourse that form the unifying bond in what otherwise would be an anarchy of scientific viewpoints; objectivity in scientific investigation must rest, therefore, upon frank recognition of the investigator's own point of view. A critical attitude toward the ascertainable presuppositions is the best method of keeping science free from dogma. . . . Science is contrasted with dogma in that it is ready to make its presuppositions the object of criticism and, if necessary, to revise them. It is not the lack of presuppositions that is the characteristic thing of science, but the self-criticism to which its principles may be subjected.[56]

And surely self-criticism is possible. Scientific cynicism is not justified; but even the cynics help us, in spite of the erroneous nature of their claims. To hold with Ayres that science is the "false Messiah" or with Henshaw Ward that man's leading resource is "the circus of the intellect" is an unfounded cynicism in the nature of a reaction, itself far from being from from emotion; but, surely, we may hear Ayres[57] and Ward[58] in their strictures on science, or listen to Joseph Jastrow tell us the "Story of Human Error"[59] without giving up. And such critics as Pareto, Samuel Butler,[60] and Aldous Huxley[61] are good for us. They belong in the social process; they help us turn the light upon ourselves as well as on physical nature; they show scientists their mistakes and thus help to clear the way for an "impersonal critically established knowledge of every phase of nature and man."[62]

[56] Barth Landheer, "Presupposition in the Social Sciences," *American Journal of Sociology*, XXXVII (1932), 539-546.
[57] C. E. Ayres, *Science the False Messiah* (New York, 1927).
[58] Henshaw Ward, *op. cit.*, the subtitle.
[59] Joseph Jastrow, *op. cit.*, p. 36, for an optimistic note.
[60] Samuel Butler, *Erewhon* (New York, 1917).
[61] Aldous Huxley, *Brave New World* (New York, 1932).
[62] C. A. Ellwood, *op. cit.*, pp. 246-247.

PART II

PSYCHOLOGICAL FACTORS IN SCIENCE

CHAPTER IV

THE MEANING AND SIGNIFICANCE OF IMAGINATION

"Imagination opens the gates of the universe"—William Patten

"Imagination! shouted Mr Pulitzer. I know what you mean by imagination! that it is necessarily inexact and irresponsible I hope you will recover from that Imagination isn't disorder or sloppiness or substituting misinformation for something that should have been definitely ascertained It isn't being lazy or indifferent or lacking personal or professional conscience No! It is what the astronomer has when he says that right there, though no one has located it, must be a star It is what Darwin had when, with the long orchid in his hand, he said that somewhere they would find the long tongued moth who visited it"—Joseph Pulitzer, Sr, to Alexander Black

'Every economist and sociologist can live at least three thousand years in imagination"
—Charles A Ellwood

I. INTRODUCTORY

PART TWO of this study of creative factors in scientific research is dedicated to an analysis of the psychological factors in science with special emphasis on the meaning and significance of imagination; and economy of space, energy, and organization demand treatment of all other intellectual, emotional, intra- and inter-personal factors only in so far as they are inseparable from the operations of the imagination. Hence this chapter undertakes to define and analyze the imaginal process; Chapter V will concern itself with situations in which artists, inventors, and scientists experience flashes of insight; and Chapter VI will portray the role of imagination in scientific investigation. But in order to lay the foundation for what follows, we must begin with the attempt: (1) to define imagination; (2) to analyze its phases and processes; (3) to classify it as to forms; and (4) to describe the factors in its operation.

II. IMAGINATION DEFINED

Imagination, like most words, is frequently used, but infrequently defined, even in the writings of scientists. Hence it becomes necessary at the very outset of our analysis to tell in what sense we are making use of this key word.

As used here, imagination means the ability to perceive configurations or wholes of reality in space and time, to observe the relations within each configuration as changing with the total situation, to experience insight into and to be able to anticipate or reconstruct the process by which the changes take place, to segregate out components of the evolving Gestalt as new wholes, and to reintegrate these new wholes in a more inclusive, ever-growing configuration of entities, processes, and relations.

This is constructive imagination. It is different from free association in that anything, any sort of a phantasy, is apt to come out of that. It is different from intelligence in that the latter includes all aspects of the process of adjusting organisms to the situations in which they move; all aspects of reasoning, as well as imagining, and evaluating behaviors and goals; and all phases of understanding. It is different from reason in that the latter is formal, moving by steps of which the thinker is fully aware and which he insists on taking one by one until he has reached his conclusion. Furthermore, reason is analytical and critical, while imagination is synoptic, synthetic, and insightful, reasoning providing steps by which we move into situations out of which insights emerge; but insights often occur without formality in the process, and by jumps across great gaps to the immediate and clear perception of processes and relations. It differs from understanding in the respects pointed out by Th. Ribot, as he said:

> The imagination is subjective, personal . . . its movement is from within outwards toward objectification. The understanding has opposite characteristics —it is objective, impersonal, receives from the outside. For the creative imagination, the inner world is the regulator; there is a preponderance of the inner over the outer. For the understanding, the outside world is the regulator; there is a preponderance of the outer over the inner. . . . Both imagination and will have a teleological character. . . . We are always inventing for an end.[1]

The definition of imagination we have presented is indebted to Ribot's definition, for whom the process of imagining involves intellectual, emotional, and unconscious factors. The intellectual factor, says Ribot, dissociates and associates mental items. Dissociation separates old configurations (not the language of Ribot, of course). Dissociation originates through internal and external factors. The internal factors of dissociation are our tendency to "see only the essential and forget the unessential, to

[1] Th. Ribot, *Essay on the Creative Imagination* (Chicago, 1906), p. 10.

find attention emotionally orientated, and the tendency to follow the law of least resistance and simplification of mental labor."[2] The external factors grow out of the fact that observable phenomena do not always appear in the same unvariable configurations. Some bodies of phenomena do, but others do not. Illustrating, Ribot says that an unvariable association of coldness and moistness in objects would make the two qualities hard to distinguish and impossible of dissociation. Association comes about through contiguity and resemblance. Association by contiguity is external, simple, and homogeneous—probably what the Gestaltists mean by ready-made *Gestalten*. Association by resemblance is internal and distinguished by three moments—presentation to consciousness of a new item, comparison of the new item with an item already in consciousness, and assimilation and later joint recall of the two items.[3]

Ribot's concept of association sounds more like classification than functional configuration, since the latter involves, not the association of similar items, but, of functionally related dissimilars, as in the interrelated system of the organs of the body. But imagination has to do with both classification and functional relations.

The definition presented is also indebted to Spearman's description of the creative aspects of mind as "the educing of correlates." He gives three principles of knowing and imagining: the principle of experience, by which one "tends to know his own sensations, feelings, and strivings"; the principle of relations, by which two or more items given in consciousness may be perceived to be in various ways related; and the principle of correlates, by which, "When any item and a relation to it are present to mind, the mind can generate another item in itself so related."[4]

It is this generation in itself "of another related item" that Spearman refers to as "the educing of correlates"; and it is this as a function of imagination that constitutes one aspect of creative insights in physical and social science and in all other phases of cultural controls.

Spearman's pupils have tried to discover by experimentation whether imagination is separable from general intelligence. They have concluded that, in the process of imagining, there are additional operations of the mind in evidence but no definitely separable factors of the mind show themselves.[5] Ribot's distinction between understanding and imagination

[2] *Ibid.*, pp. 20-21. [3] *Ibid.*, pp. 24-25.

[4] C. Spearman, *Creative Mind* (New York and Cambridge, 1931), pp. 15-23.

[5] H. L. Hargreaves, "The 'Faculty' of Imagination," *The British Journal of Psychology* (Monograph Supplements), X (1927), 63.

is not exclusive. He makes no claim that neither operates apart from the other but rather speaks of the preponderance of the outer world in the former and of the inner world in the latter. It seems likely that the inner world is preponderant in both understanding and imagination, since there is little room for the "glassy-eye" hypothesis of mind.

Hence, in defining imagination, instead of contending that imagining takes place as an entirely separable mental factor, we see it only as the most dynamic activity of the human mind.

It is perhaps the difficulty of isolating the concept of imagination from all other aspects of thinking that leads L. L. Bernard to hold that the concept is too general to be very useful; and it may be granted to Professor Bernard that the term is rather general in its meaning;[6] but it would be hard to conceive of a term that has been freighted with more numerous and diverse meanings than the substitute he proposes of *conditioned response,*[7] which by no manner of means can be defined as imagination has been defined above. If imagination is general, so is the hub of a wheel; yet there are many ramifications; and in the hub of imagination we have outlined the integrated, if varied, processes in the terms of our definition, which will be further analyzed in the discussion of the concepts of: (1) imagery, (2) memory, (3) foresight, (4) synopsis, (5) insight, and (6) synthesis, in the given order.

III. AN ANALYSIS OF PHRASES OF IMAGINATION

A. Imagery

Imagery is our ability to see the unseen, to think of things not present to sense, to look one moment at a radio dial and perceive it, the next moment to close the eyes and still be conscious of an "inside" picture of it; to hear a singer bring a fading bird-note to a conclusion and still continue to "hear" it; to experience a handshake of a month ago, to sit by a stream a thousand miles away, or to hear the waves breaking on distant rocks.[8]

Eye-minded people think of imagery as being visualization, but images are possible in terms of all the senses. Seeing is believing for man, but smelling is believing for dogs. Jastrow studied two hundred persons at institutions for the blind in Philadelphia and Baltimore. Twenty of them,

[6] L. L. Bernard, "The Great Controversy, or Both Heterodoxy and Orthodoxy in Sociology Unmasked," *Social Forces,* XIV (1935), 64-72.

[7] *Loc. cit.*

[8] Cf. Knight Dunlap, *The Elements of Scientific Psychology* (St. Louis, 1922), pp. 159-160.

blind after the age of seven, had dream-vision, while those who were blind before that age could hear or feel but not see in their dreams.[9] Laura Bridgman neither saw nor heard in dreams. Her images were all tactual-motor, and her world was hard-soft, heavy-light, and thick-thin. Thomas D. Cutsforth, blind since the age of eleven,[10] has synesthetic visual powers in which tones assume colors; and the writer has had as a pupil an artist who assigns colors to voices and who has created a chart of tones corresponding with colors.

That imagery does not present us with a world of "bare-whats" as naked, cold, impenetrable things, which the observer must find in order to become a scientist; that no such things are to be found in sense impressions as the data of science is just as evident as the fact that the images we have do not suggest that the world has imagination as the ultimate ground of reality in both the Creator and the created.[11] There is no such world within the human ken as "the substrate that appears when use and purpose, cosmic significance, artistic value, social utility, [and] personal reference, have been removed."[12] In such a world there would be no "preponderance of stimuli" to which even the scientist could respond; and in such a world there would not only be no science but there would be no society, no meaning, and no mind. Titchener, who states that the "instinctive tendency" of the scientist is toward such a substrate, sharply modified his view when he said that the scientist would want to know how the facts, if they could see, would look to one another; that the scientist is not an indifferent detective but a "sympathetic witness," whose observation is a "sort of participation."[13]

The first hypothesis suggested by the data of imagery, then, is the dynamic and creative nature of the human mind, as observed in the following cases: (a) the phenomenon of synesthesia; (b) the principle of closure; (c) response to relations as well as things; (d) perfect images in imagination; (e) experience with ink-blots; (f) imagery called up in memory; and (g) projected worlds.

The phenomena of synesthesia suggest a complex nature for the

[9] Joseph Jastrow, *Fact and Fable in Psychology* (New York, 1900), pp. 351-361.

[10] R. H. Wheeler and Thomas D. Cutsforth, "Synaesthesia and Meaning," *American Journal of Psychology*, XXXIII (1922), 361-384.

[11] Edward Douglas Fawcett, *The World as Imagination* (London, 1916).

[12] E. B. Titchener, *Systematic Psychology* (New York, 1929), pp. 32-33, 39.

[13] *Ibid.*, p. 39.

sensorium which, while it limits the number of possible images, permits a very wide range of modifications and combinations.

The principle of closure is itself a function of imagination which indicates rather definitely that imagery is by no means a photographic process but a dynamic, creative activity; for, when one is looking at a figure with gaps in it, as the Gestalt psychologists point out, the tendency is to overlook the gaps and close them up imaginatively, not as a result of experience with numerous objects, but as a result of the brain's way of seeing a mass of stimuli presented through the eye.

That the eye responds to relations as well as to things is another datum which eliminates the "glassy-eye," photographic-plate theory of observation. Experiments have shown that the eye does not respond to dark-as-such and light-as-such in figures side by side but to the relation "darker-than" or "brighter-than" between objects;[14] and everyone knows that we respond to relations in musical scales and in harmony.

In mathematics we know that perfect circles and squares exist only in imagination, but they do exist there. How could we account for them without the dynamics of imagery or by the principle of conditioned response?

One of the best demonstrations of the fact "that imagination enriches the presentations of the present moment; [that] what is actually given in sensory content is poor, indeed, when compared with the wealth of material poured in by imagination"[15] is experiments with the "bare-whatness" of ink-blots.

F. C. Bartlett asked subjects to respond to thirty-six ink-blots, telling what they saw in each. No two saw the same things in the same blot. One blot reminded nine observers of nine very different scenes: (1) "irate lady talking to a man in an arm chair"; (2) "bear's head, and a hen looking at her reflection in the water"; (3) "angry beadle ejecting an intruding beaver which has left foot marks on the floor"; (4) "man kicking a football"; (5) "lakes and green patches of meadow land"; (6) "scarecrow behind a young tree"; (7) "tiny partridges newly hatched"; (8) "animal pictures and the crown prince of Germany"; and (9) "smoke going up." And Bartlett shows clearly that the images seen depended very largely on the previous experience of the subjects.[16]

[14] H. E. Garrett, *Great Experiments in Psychology* (New York, 1930), chap. xi.
[15] B. B. Breeze, *Psychology* (New York, 1917, 1921), p. 275.
[16] F. C. Bartlett, *Remembering: A Study in Experimental and Social Psychology* (Cam-

So far the data cited show that imagery robs the world of sheer sensory content and clothes it with psychic forms. Its further functioning appears in the part it plays in reproductive and creative imagination. The position of Bartlett is that images pick bits out of schemes in past situations, settings of a year ago, and reinstates them largely unimpaired in combination with something that happened yesterday to help a man to solve a problem with which he is confronted today.[17] This function will be considered further under the concept of memory.

Finally, nothing is more obvious than the imagery that constitutes the psychic content of our projected worlds; but the facts show that human beings can conceive of worlds such as they can have no possible images of—a world of imagination depending for its images and concepts upon senses of an entirely different kind from our own. J. B. S. Haldane has outlined "some possible worlds," ranging all the way from the world of a barnacle clinging to a ship, with his particular kind of sensorium, on through to the most complex worlds; worlds of which we, with our sensoria, can have no comprehension.[18] Professor A. M. Low asks whether "atoms are inhabited," and affirms that the air is full of sounds that we cannot hear and the ether moving with light we cannot see. He tells us that there may be other forms of life, existing in thought alone, or seeing by heat, or living by what would be poisonous to us; that men on Mars would not have to be like us, and that the question as to whether other planets are inhabited does not depend upon conditions being like those on earth.[19]

The second hypothesis suggested by the data of imagery is its tremendous part in the social process as a factor in the space- and time-binding qualities of the human species.

Alfred Korzybzki has called plants chemistry-binding, animals space-binding, and men time-binding organisms.[20] William Patten expresses the same idea in another way, and, in comparing animals and the human species, says:

> Animal life . . . is a serial response, or a moving picture . . . of the present external world of reality expressed in terms of protoplasmic activity. This animal life . . . is itself a reality just as much as the world external to it is a

bridge, 1932), pp. 35-36; cf. G. B. Dearborn, "Blots of Ink in Experimental Psychology," *Psychological Review*, IV (1897), 200-291.

[17] *Ibid.*, p. 219.

[18] J. B. S. Haldane, *Possible Worlds, and Other Essays* (London, 1927).

[19] A. M. Low, "Are Atoms Inhabited," *Sphere* (London), Sept. 14, 1935.

[20] Alfred Korzybski, *Manhood of Humanity* (New York, 1921), chap. iii.

reality . . . not the same reality, (however), any more than the vibrating string . . . is the same thing as . . . the nervous reactions . . . air waves . . . produce in man. . . . No animal can live, in the past or in the future, or for one instant outside the established sanctuary of physicochemical conditions essential to its being; not, so far as we know, can it consciously utilize the past to establish more profitable relations with the future. . . . [But] in man, a new vital factor has been introduced. In addition to this older animal machinery of direct neuromuscular response to the outer world of the present, man has acquired a mental . . . power that enables him indirectly to picture and interpret the past by means of the present and thus to explore those regions of the outer world which lie outside and beyond the physical sanctuary within which his own body is confined. . . .

In man, the chief mechanisms of plant and animal life are still utilized, but they are heavily reinforced by his new instrument, the imagination, the eyes and legs of his spiritual body, the real seven-league boots . . . with which he annihilates time, and space, and matter, and with which, in effect, he may project himself far beyond the confines of his physical sanctuary (physical surroundings) into realms his physical body may not enter. . . . It gives him the power to look over the edge of yesterday and the top of tomorrow into the abyss of universal time. . . . Ever checked and corrected . . . it is the . . . agency by which man is . . . upbuilding, renovating, and systematizing his science, his philosophy, and his religion; short-circuiting the roundabout methods of chance, and hastening the discovery of the constructive way.[21]

Professor Patten has sketched in broad outline what the definition of imagination given at the outset calls the perception of configurations in space and time, imagery being a very considerable part of the content of such configurations, with sympathetic appreciation of other minds and processes being another considerable part.

As a matter of fact, the space-binding qualities of man have been tremendously enhanced by his time-binding capacities, else he would be much more space-bound than many birds and other animals, so far as terrestrial locomotion is concerned;[22] and, as for bringing the telescopic and the microscopic within his ken, he would be almost as space-bound.

The part that imagery has played in the development of knowledge of the earth was clearly shown by Alexander von Humboldt a century ago in his *Cosmos* under the caption of "incitements to the study of nature," as he said:

If I might be permitted to instance my own experience, and to recall . . . the source from whence sprang my early and fixed desire to visit the lands of

[21] William Patten, *The Grand Strategy of Evolution* (Boston, 1920), pp. 291-295.
[22] Hornell Hart, *op. cit.*, p. 86; for accelerating human speeds, see p. 76.

the tropics, I should name George Forster's *Delineations of the South Sea Islands,* the pictures of Hodge, which represented the shores of the Ganges, . . . and a colossal dragon tree in an old tower of the botanical gardens at Berlin.[23]

Imagery may have created its hobgoblins, its monstrosities, its witches and its devils; but at the same time it has made possible a world of values, has formed the basis for the discovery of new relations in science and laid the foundations for the perfection of the forms of art. For imagery constitutes much of the materials of imagination and memory.

B. Memory

Professor James Ward conceived of images as existing in a fixed order and position in the memory or in what is expected, while imagination transposes and changes its ideas.[24] Perhaps such a fixed order occurs only in the memory of certain spatial and temporal patterns stamped indelibly on the mind. The present view proceeds with a dynamic theory of memory as it has in the case of imagery; of memory as *recreating* rather than *reproducing,* because what wells up out of the past has been reclothed by intervening and present experience. And, after much experimentation, F. C. Bartlett agrees with this view. He seems inclined to discard the word *memory* as not being descriptive of reproductive imagination, memory being too passive even for that in the traditional use made of the concept. Bartlett holds that recall is much more dynamic than the "storehouse" concept of the mind implies; and that it must be understood as the function of a "schema," a word which he borrows protestingly from Head and uses in the sense of an "organized setting" or configurated present, which selects in dynamic fashion appropriate elements from the experience of the past. In many thousands of cases of remembering which Bartlett has collected, refusing to use nonsense material of the Ebbinghaus brand because "it weights the evidence in favor of a mere rote capitulation," he found that literal recall was very rare; and "with few exceptions . . . re-excitement of individual traces did not look to be in the least what was happening. . . . In fact, if we consider evidence rather than pre-supposition, remembering happens to be far more decisively an affair of construction rather than one of mere reproduction."[25]

[23] Translated from the German by E. C. Otte (London, 1849).
[24] James Ward, *Psychological Principles* (Cambridge, 1920), p. 206.
[25] Bartlett, *op. cit.,* pp. 204-205.

C. Foresight

The very present moment in which I say *I am* and *it is* finds pouring into it the river of *it was* and *it will be* from which point all flow on together into tomorrow. The present is no bigger with the past than with the future, and the future is big with the past and the present evolving endlessly as one—whatever one it may be.[26]

This whatever-may-be facing the human being and all other species probably finds only the human animal possessed with any real foresight. Lower species indulge in exploratory activity carried on with some degree of expectation, of shaping, in concrete situations, ready means to instinctive ends, with only the rudimentary elements of invention-with-foresight manifested.

Some birds show rudimentary inventive tendencies in nest building; and so Köhler's apes, observed during the World War in the Canary Islands.[27] If, however, true foresight, which involves looking into the future and attempting to shape the future by molding present devices and events, is the concept meant, then, it can be said with certainty, only human beings manifest it.

Foresight in man makes possible his active adaptation of his environment to create continuously a new world by always "doing something to" and with his environment. As Babcock puts it, man began with an endowment, involving at the same time a great challenge, which he accepted.[28] With less ready-made equipment to attain his ends than any other animal, with the capacity for increasing his wants possessed by no other animal, but with a mind pre-experiential, pre-traditional, and pre-scientific, and thus, in the beginning, possessed with less foresight or power to predict the future than he gained with experience, his active adaptation began, always with foresight made possible by experience and imagination in its fullest sense. The end results of such active adaptation, or rather strands in the process, have been man's shaping (1) of his environment to his felt needs; (2) more specifically, the development of inventions to aid him in the control of his subsocial and social environment; (3) an eternal exploratory activity by which man has continuously enlarged his world—the work of science, which is carried on in precisely the same manner as man has built his culture; (4) another type of activity no less exploratory and even more daring by which man has sought to

[26] B. B. Breese, *op. cit.*, p. 275. [27] Wolfgang Köhler, *op. cit.*, chaps. v-vi.
[28] E. W. Babcock, *Man and Social Achievement* (New York, 1929), chaps. ii, iv.

understand the significance of his world and of his life within it—the work of philosophy and religion; (5) the attempt of man to appreciate his world and to clothe it with beauty—the work of art; and (6) man's attempt to envision what is appropriate in his behavior, to develop a sense of rightness in his relations—a system of ethics.[29] All these activities have come about because man can look ahead of him as well as behind him; because his future shapes him no less than his past; and, as we shall see fully later on, this is not a process that can be fully accounted for by learning by *trial-and-error, conditioned response,* or *psychic-accidents.* It is a process that does proceed in part by all three of these methods, but the shaping of man's world and of his present behavior by the future demands, in addition to imagery, memory, and foresight, the processes yet to be discussed: synoptic vision, insight, and synthetic imagination.

D. Synopsis

Synopsis or *synoptic vision* is the *wholesight* necessary as a prelude to insight. The "overworked" man from Mars whose objectivity has so often been praised would have a different sort of objectivity from that assigned him by the fact that he is an outsider. This outsideness would be a distinct disadvantage. His advantage would lie in the process of approach and withdrawal from the earth. His approach would give him wholesightedness in synoptic vision. His earth would present itself to him as a whole and this wholeness of sight would lend itself to the Martian's insight into its internal relations upon his arrival. He would be greatly handicapped to come blindfolded to earth and begin his first study with a blade of grass, moving from one sense datum to another until he obtained a Pearsonian connection of terrestrial relations. Coming, however, with synoptic vision, and spending his earthly visit in intimate contact with significant aspects of the configuration his approach made possible, his journey away from the object of his study would afford him a synthetic vision, accompanied by insight into relations of configuration he had never before discovered. Thus may be clarified what is meant by contending that insight stands between the mental processes of synopsis and synthesis.

On the point of this contention Gestalt psychology sheds a vast amount of light. And relevant here is W. Köhler's quotation from Clerk Maxwell:

[29] H. E. Jensen, in *Social Progress and Christian Ideals* (Nashville, 1931), pp. 324-325.

We are accustomed to consider the universe as made up of parts, and mathematicians usually begin by considering a single particle, and then conceiving its relation to another particle and so on. This has generally been supposed the most natural method. To conceive of a particle, however, requires a process of abstraction, since all our perceptions are related to extended bodies, so that the idea that the *all* that is in our consciousness at a given instant is perhaps as primitive an idea as that of any individual thing. Hence, there may be a mathematical method in which we move from the whole to the parts instead of from the parts to the whole.[30]

Clerk Maxwell remarks elsewhere that "Faraday's methods resembled those in which we begin with the whole and arrive at the parts by analysis, while the ordinary mathematical methods were founded on the principle of beginning with the parts and working up the wholes by synthesis."[31]

It has been contended that Gestaltists are opposed to both analysis and synthesis, but they are really opposed in an unqualified way to neither process. Gardner Murphy denies the school is opposed to analysis and affirms that synthesis is what it disputes.

We begin [he says] with wholes, not with parts; experience is no mosaic of pieces but, in its pristine and original form, a unit from which the process of living gradually split off one part from another. Such parts may in turn be split up farther, if the exigencies of life force such distinctions upon us. This is what the Gestaltists mean when they insist that their psychology objects not to analysis but to synthesis, not to the recognition of the process of individuation within the total mass, but to the assumption that the mere putting of the pieces together would somehow explain or give reality to the original *Gestalt*.[32]

It may be readily admitted that all Gestaltists oppose analysis in the sense of the word that parts may be abstracted from the whole and considered qualitatively unchanged in the process. This opposition follows because Gestalt doctrine holds that the configuration gives its components all the meaning they possess. When these components enter into another configuration, they change their character entirely, or at least greatly.[33] And it also may be granted that the school opposes synthesis in the Gardner Murphy sense. But no Gestaltist would go so far as to say that a configuration remains rigid; that after a large whole is split up into smaller

[30] George W. Hartmann, *Gestalt Psychology* (New York, 1935), p. 30, quoting Clerk Maxwell from Wolfgang Köhler. [31] *Loc. cit.*

[32] Gardner Murphy, "The Geometry of Mind," *Harper's Monthly Magazine*, CLXIII (1931), 588. [33] Hartmann, *op. cit.*, p. 275 n.

wholes they are never reintegrated into a synthetic whole different in Gestalt quality from the original synoptic whole.

The principle by which synoptic wholes change with analysis are further indicated in R. H. Wheeler's statement of eight organismic laws, which lead us on to the meaning of *insight and synthesis*.

The first is "the law of field properties," which is that all items of reality are integrated wholes that are more than the sum of their parts; the second is "the law of derived properties," by which the properties of parts are derived from the whole; the third is "the law of determined action," in which the whole conditions the functions of its parts; the fourth, "the law of individuation," in which "parts emerge from wholes through a process of differentiation," but they emerge as wholes in their own right; the fifth, "the law of field genesis," through which wholes evolve as wholes; in the sixth, which is "the law of least action," every energy exchange takes place in the shortest spatio-temporal interval; in the seventh, "the law of maximum work," if the balance of a system be disturbed, its entire energy is used in restoring the equilibrium; and in the last one, "the law of configuration" allows no discrete events. The future governs the present and the past as truly as the past and the present govern the future.[34]

The fifth, sixth, seventh, and eighth laws given in organismic theory by Wheeler indicate the readjustment taking place within a configuration, causing the reorganization of the original configuration into a new one with new wholes as component parts; and this is surely synthesis taking place in the train of insight into new relations.

Thus Gestalt theory presents a view of reality as consisting of related configurations in their own right, not a disconnected world such as Hume's which the schoolboy claimed to know more about when he wrote, "Oh, it is just lots of things twiddling around and they are all of different sizes!"[35] It also presents some ideas as to how these *wholes* emerge into consciousness, not by any passive impression of ready-made Gestalten upon the human psyche,[36] but through the dynamic activity of the personality as the most creative entity of all—in fact, the distinctively creative entity. In this world of configurated entities, the more formal aspects are, as we have seen, according to Ribot, more impressed upon the personality

[34] R. H. Wheeler, *The Laws of Human Nature* (New York, 1932), pp. 173-177; cf. Hartmann, *op. cit.*, pp. 70-75. [35] A. M. Low, *loc. cit.*

[36] Wolfgang Köhler, *Gestalt Psychology* (New York, 1929), pp. 174-175.

by external factors, which in his view regulate the *understanding* as opposed to the *creative imagination* for which, as already indicated, Ribot thinks the inner world is the regulator. But, in so far as configurations may exist independent of subject-object relations, it is creative imagination that brings them into such relations and uses understanding as a basis for the generation of new relations through creative insight.

E. Insight

We have spoken of one phase of imagination as consisting of experiencing insights into relations and being able to anticipate or reconstruct the processes by which changes in experienced wholes take place; and we have referred to C. Spearman's concept of "educing correlates" as a function of these creative insights. But, if the "educing of correlates" consists only of inventive combinations, this work is not the only function that insights perform; for the forms of insight are varied, and the functions vary greatly with the forms.

The kind of insight for which "The educing of correlates" is a function is formal, or insight into spatial relations. Other forms of insight are *Einfühlung,* or naturalistic empathy, by which the artist "feels himself into" a scene he is painting, or a scientist anticipates the effect that will be produced when he introduces the elements in an experiment, imaginatively rehearses the processes taking place in nature, and describes them in human terms—a practice no less of the ecologist and the evolutionist than of the animist; true dramatic insight, or social sympathy; and ego-analytic insight, yielding objectivity. These forms and their functions will be given more adequate treatment later. Here we can discuss in a preliminary way only insight into spatial-functional relations, which is not entirely separate from naturalistic empathy in the second form; and we may, as Spearman does, instance Archimedes' discovery of the method by which he determined whether King Hiero's crown had been adulterated.[37]

One day, while puzzling over the problem of the crown, Archimedes observed the water rising on the sides of a vat while he was immersing his body in the bath. Immediately he ran into the street, crying "Eureka!" He had found a way of computing the cubic content of the crown; and knowing what a given volume of gold weighed, he could now dip the

[37] *Creative Mind* (New York and Cambridge, 1931), pp. 15-23; cf. A. L. Porterfield, "Imagination in Social Research," *Sociology and Social Research,* XX (1936), 219-228.

crown in water, watch the displacement, and see whether its volume was greater than it should be if pure gold.

The steps he took toward the solution of the problem were probably somewhat as follows. His synoptic view of the problem was selecting every phenomenon that would fit into the subject-object configuration and rejecting every phenomenon that would not functionally enter into it. This particular phenomenon was taken into the configuration through insight into its relations with other components: "Weight of crown is so much, but what is its volume?" "Why can I not solve this problem, finish this task?" "My body displaces the water; the water rises in the vat—crown in water—Eureka!"

It was because Archimedes could call his imagination into play to "put together pieces of configurations," as Willard Waller writes,[38] "to perceive with insight configurations of events" not all of which were present to the senses, that he could solve the problem. He and the crown might have "turned to dust" before he could have solved the problem by the trial and error method (to call the event a *conditioned response* would be to make the term mean so many things that it would mean nothing at all);[39] and Ehrlich's jabbing of mice, rabbits, and guinea pigs through 605 experiments in search of success in the discovery of 606 and Edison's 5,000 experiments with a storage battery which showed 5,000 ways that would not work, were no more blind fumbling than they were lost effort. For, as in the case of Archimedes, their synoptic views or original configurations rejected without trial more candidates for admission into the attempt to solve the problem than either the 605 or 5,000 efforts that the one and the other of these men made toward reaching his goal. Trial and error helped, but did not form a guiding principle.[40] Tolman, Köhler, McDougall, and others have shown many cases indicating that not even animals other than men are entirely without insight in the learning process.[41]

Another function of insight in general is the formation of concepts,

[38] Willard Waller, "Insight in Scientific Method," *American Journal of Sociology*, XL (1934), 285-297, 289.

[39] Walter Hunter flatly rejects, as do many others, the concept of insight in learning, holding that the concept of conditioned response is adequate to describe what takes place in such events. See "Experimental Studies in Learning," in Carl Murchison (ed.), *Handbook of General Experimental Psychology* (Worcester, 1934), chap. xi.

[40] E. T. Krueger and W. C. Reckless, *Social Psychology* (New York, 1931), pp. 222-224.

[41] E. C. Tolman, *Purposive Behavior* (New York, 1932); William McDougall, *The Energies of Men* (New York, 1933), p. 349; W. Kohler, *The Mentality of the Apes.*

which may be referred to as synoptical mental searchlights casting about for an understanding of or the discovery of further significant relations. Waller writes, with reference to Blumer's concept of concepts:

> Herbert Blumer . . . has defined the concept in terms of the assistance which it renders in filling in gaps and open spaces of perception. It is true that the concept does this, but this aspect of the concept should be interpreted rather as imagination, which is the tendency of the mind to complete a configuration when only its rudiments are presented to consciousness. . . . A concept is not necessarily a construct. . . . The scientific concept often is a construct . . . whose totality is the work of the imagination.[42]

Hartmann asserts that perhaps the most acceptable definition of insight to the Berlin school of Gestalt is *"the phenomenal correlate of the 'closing' of a configuration."*[43] It is the idea advanced by Waller, however, of "putting together pieces of configurations" that leads directly to the concept of synthesis.

F. Synthesis

Clark Wissler well illustrates how synthesis in the imaginal process comes about. In a certain passage, he has been describing the learning of the anthropologist as it proceeds by analysis, through the segregating of new from larger wholes in the distinction of successive horizons of the Stone Age, Bronze Age, and Iron Age. He has shown how the Stone Age became two, Paleolithic and Neolithic, in the scientific mind, and then how the Paleolithic Age became subdivided into cultural epochs, Gestalten such as the Prechellean, Chellean, Acheulean, Mousticrian, Aurignacian, Solutrean, Magdalenian, and Azilian levels of that age. And now he turns to the process of synthesis following insight, until a whole, which would fit into a larger scheme, takes its place in that larger scheme after its discovery and definition.[44]

For an understanding of this process witness the work of Lewis H. Morgan, who discovered relationship systems, or at least, "achieved an intriguing insight into a type of phenomena still intriguing anthropology and the social sciences as well." "With the theoretical work of Morgan," suggests Wissler,

> most of you are familiar, but perhaps few of you have taken time to look into his life and thereby become aware of his important contribution to an-

[42] *Loc. cit.*

[43] Hartmann, *op. cit.*, p. 188; Kohler, *Gestalt Psychology*, chap. i.

[44] Clark Wissler, "Anthropology," in Wilson Gee (ed.), *Research in the Social Sciences* (New York, 1929), pp. 94-96.

thropological research: Morgan was born in 1818 in the Iroquois country of New York State, and as a boy learned to speak the language of the Iroquois. To make a long story short, Morgan discovered the existence of the Iroquois social organization and the famous league of the Iroquois. No doubt the process was one of putting two and two together from the very first until certain patterns appeared. But [says Wissler] while on a business trip to Michigan he met some Ojibway Indians, and on casual inquiry as to their relationship scheme, discovered a closely parallel system. This was to him a revelation; no longer could he say that the Iroquois system was a mere accident. Further, he suspected that in this direction might lie a distinction between primitive and European peoples, but saw clearly that the only way to deal with this problem was to approach the subject empirically in a world-wide survey. Moreover he conceived of the European social order as a growth by natural processes, and that principles of social behavior, having wide validity, could be discovered, once the data for primitive peoples were available.[45]

It is thus that insight into the relations of two wholes leads to the synthesis of both into a greater whole, first hypothetically, and then through examination of the greater hypothetical whole, the work of analysis may begin all over again.

IV. TYPES OF IMAGINATION

The concept of types of imagination corresponds with but does not duplicate the concept of forms of insight, since imagination is more inclusive in its implications, involving, as outlined, imagery, memory, foresight, synopsis, insight, and synthesis as its phases. In one sense, imagination is the method of insight, the latter being the *inseeing* moment of the imaginal process. Thus, spatial imagination leads to insight into spatial relations, functions, and forms; social imagination leads to true dramatic insight, and naturalistic-empathetic imagination eventuates in *Einfühlung*, which may be either impressionistic or dramatic-cinematic in nature or form. The fourth type is private imagination, which is often completely without ego-analytic insight, or objective self-knowledge.[46]

[45] *Loc. cit.*

[46] Th. Ribot classified imagination as being plastic, diffluent, mystic, scientific, mechanical, commercial, and Utopian in its forms. What we have called spatial imagination is probably more akin to what Ribot means by his plastic, scientific, and mechanical types; social imagination more akin to his diffluent, commercial, and Utopian types; and private imagination may approach to some extent his mystic and certain aspects of his diffluent types, as is also true in the case of what is here termed the naturalistic-empathetic. See *op. cit.*, pp. 184-310.

A. Spatial Imagination

Spatial imagination means no more than the imagination functioning in the perception of physical wholes and relations. It is the imagination of the physical scientist, the inventor, and the mathematician. It also functions in the philosopher, but so do all the other forms or phases of the imaginal process. It may assume either concrete or abstract forms. Illustrations of its function will follow in the next chapter.

B. Social Imagination

We have already defined social imagination as sympathetic imagination, the source of the dramatic insight mentioned above; and we shall discuss its function at length in later chapters; but of it Willard Waller says:

> This is the scientific method that consists of imagining what it would be like to be somebody else. It is characteristically an interpretation of the behavior of others in terms of purposes and emotional states imputed to them. Insight of this kind is wrongly called introspective; for introspection is a mode of studying phenomena at first hand, while this kind of insight is derived from imagination which makes use of introspection as a clue to the mental states of others.[47]

C. Naturalistic-Empathetic Imagination

This is the method par excellence of the artist as he expresses his experience in terms of form, color, harmony, rhythm, and tone; of the painter, poet, sculptor, architect, musician, and often the dramatist and the novelist, although these latter two usually make more use of strictly social imagination. The poet "wanders lonely as a cloud" and describes human yearnings in terms of "tides on a crescent sea-beach, when the moon is new and thin." Thomas Hardy "feels himself into" the landscape in *The Return of the Native* and sees the destiny of his characters as being determined by that landscape. The musician drinks in impressions of nature through all the senses and tries to express them in such a way as to reimpress them through all the senses of his hearers by means of harmony, rhythm, and tone. The impressionistic painter tries to convey sense impressions and emotions in a perfectly nonconceptual way. Instead of painting "the thing as he sees it," he paints the thing as he feels it to produce a like feeling in others.

[47] *Loc. cit.*

These cases may be classed under naturalistic impressionism, to which we have referred as one kind of *Einfühlung*, the other kind being more formal and conceptual in its nature; that is, it is dramatic-cinematic.

Dramatic-cinematic empathy is a method of both the artist and the scientist in all fields. By it the painter takes part in a changing configuration, the astronomer takes flight through galactic space, the physicist imagines himself in the world of the atom, the archeologist reconstructs his ancient ruins, the cytologist observes the behavior of cells, and the comparative psychologist participates in the doings of his animals.[48]

Without spatial and dramatic-cinematic exercise of the imagination, the scientist and the artist both remain the mere "owners of a lot of technique," without any powers of creation;[49] and social science is blind without social or sympathetic imagination leading to dramatic insight.

Physical scientists are like artists in the use of spatial and naturalistic-empathetic imagination,[50] and social scientists are like them in the use they make of social imagination, but there can be little place in science for sheer impressionism and no place for private imagination as the last in our outline of imaginal types.

D. Private Imagination

Private imagination is imaginal processes at work without being subject to the inspection of other minds and without either internal or ex-

[48] Cf. C. H. Cooley, *The Social Process*, p. 395.

[49] Robert Henri, thirteen years after he left the Academie Julien as an art student, returned (in 1901) to his old school and found "the owners of a lot of technique" still there. Speaking of these students, Henri said: "At almost any time in these thirteen years they have had technical ability enough to produce masterpieces. Many of them are more facile in their trade of copying the model, and they make fewer mistakes and imperfections of literal drawing than do some of the great masters of art. . . . One wants to be a *master* of technique rather than to be the owner of a lot of it. Those who simply collect technique have at best only a second-hand lot." See quotation in R. C. Cabot (ed.), *The Goals of Social Work* (New York, 1927), pp. 183-184.

[50] It would be a mistake to speak of the imagination of the artist and of the scientist as assuming entirely different forms. We shall see that many scientists and inventors have also been artists. Of the kinship of the imaginal process in both Roger Fry gives us a hint in his discussion of the artist's vision. He says that the artist, "as he contemplates the particular field of vision," finds that "the . . . chaotic and accidental conjunction of forms and colors begins to crystallize into harmony. . . . Certain relations of directions of line become for him full of meaning . . . and these lines . . . stand out so clearly from the rest that he sees them far more distinctly than he did at first. Similarly colors . . . become so definite and clear to him . . . that he can state them positively and definitely. In such a creative vision the objects as such tend to disappear . . . and to take their places as so many bits in the whole mosaic of vision. . . ." So the scientist sees wholes, relations, processes, instead of isolated facts or mere aggregations of facts. See Roger Fry, *Vision and Design* (New York, n.d.).

ternal controls. It reaches a degree of privacy in the mystic and at times in modernistic art. Its doors are completely closed, however, in a psychosis in which the patient constructs a logical system all his own from which the outside world is excluded. Private imagination may be creative in its own way.

A patient, a young girl, writes:

My dear Mama—It is time that I leave to return home. I have been tremendously changed for the better. I think papa will be able to get me a commission under Garibaldi before long. There are three to whom I am especially indebted—one Mr. C., the modeller, the other the doctor, a Eunuch, who modelled me at the fire, and attended on me and bathed me. He is, I am sure, a gentleman, a splendid doctor. Could not papa get him into a regiment abroad? And there is the nurse. Could not papa get him any situation away from Morningside Asylum where I am at present? I should like papa to come for me as soon as possible. Do you remember the verse, There are, etc., (12th verse, 19th chapter of Matthew) about Eunuchs? Then I beg to inform you that according to scripture and my conscience, Jerry, your cook, is a man; and D. and H., boys who can have children. Aunt I. is a man, and yourself, also, both made of men, and I am a boy, made of Dr. C. and Dr. Z. Mrs. T. is a man, made of men. They are very ignorant of this subject here; but as for me it is certain that the spirits have showed me, which Christ sent while I was under drugs; they showed me this. I have at times since I came here passed the shadow of death, and therefore am authorized to speak in opposition to all men and women, gentlemen and ladies who oppose me. I am, I can swear, as you want to know, a mixture of a nymph and a half-man, a half-woman, and a boy, and a dwarf, and a fairy. I know more than my fellow mortals, having expired eleven times before the time, etc.[51]

In this girl's imagination, all the relations of life are changed into a great medley and are jumbled so that no idea joins to another in any controlled way. From the ravings of this pitiable child to the most systematic reasoning of an Aristotle or an Einstein there are all degrees of control for generated relations. Perhaps there is no modern scientist who is compounded of a nymph, a half man, a boy, a dwarf, and a fairy; but as we survey some scientific productions, we may feel that some of us have moved far down the scale of imaginative controls, both internal and external, before the merciful shadows of which this girl speaks claim us for a twelfth and final passing.

Scientific imagination cannot be private and unreportable. It must

[51] C. Spearman, *op. cit.*, pp. 125-126.

be subject to rational criticism and control by comparison with the products of other minds both inside and outside the laboratory.

V. FACTORS IN IMAGINATION

The first factor operative in imagination is one that makes possible the process of rational criticism and control, spoken of above. It is the intellectual factor. The other factors are, according to Ribot, emotional and unconscious states of the organism. Out of these three sources, the intellectual, the emotional, and the unconscious, imaginal processes flow.[52]

A. The Intellectual Factor

When the intellectual factor operates alone, or with the least possible interference of emotional coloration, the result may be called reasoning. Reasoning is often equated with a sort of formal logic. It is, however, not always embodied in formal propositions and does not always perform the mere critical operations already suggested. As Swabey holds, it is a matter of experience "in the process of organizing its data on the one hand," and, on the other, "of performing the equally valuable negative function of exposing contradictions."[53] In the latter service, it is more the subject of formal logic. In the former, reasoning is closer to that aspect of thinking which we have designated as imagining, operating in the process of organizing coherent systems, which, Swabey says, constitute the ideal of reason—"a single all-inclusive system with no grounds outside itself."[54]

Eugenio Rignano equates the organizing and inductive process of reasoning with imagination. He objects to the "kind of inferiority that certain authors have wrongly attributed to reasoning as compared with actual experiment," and believes that reasoning itself can lead to new discoveries. "It would be difficult to find," in his opinion, "a more erroneous or more astounding statement [that the conclusion is implicit in the premises], in view of the number of *new facts discovered in certain sciences by means of reasoning pure and simple*."[55] To those who ask how a combination of experiments already known can lead to the discovery of new results, he answers that it comes about through the productivity of imagination in creating new combinations with old mnemonic

[52] Th. Ribot, *op. cit.*, chaps. i-iii.
[53] M. C. Swabey, *Logic and Science* (New York, 1930), p. 47.
[54] *Loc. cit.*
[55] Eugenio Rignano, *The Psychology of Reasoning* (New York, 1923), pp. 88-89.

elements. It has been observed that a metal bar is elongated by heat. Then, what may be expected to happen when a clock is moved from a cold to a hot room? It will go slower. Observation in this case will prove what really needs no proof—a new fact.

The negative service of reason, the service of logical criticism, is, as above indicated, a factor in imaginal control. Here reason uncovers contradictions and criticizes the suggestions of imagination. It holds the emotional factor in leash and becomes the nemesis of "wishful thinking." When it sleeps, even so notable a scientist as G. Eliot-Smith can cite independent invention as evidence that there is no independent invention;[56] or an equally notable scientist, Sir Arthur Keith, can suppose that abnormal bodily conditions caused by endocrine disturbance in one race are the normal bodily conditions of another race; or, more clearly speaking, that racial differentiation is the function of the endocrine glands, and that the same kind of functioning that disables one race produces a like set of general physical characteristics in another without disabling it.[57] Even more illustrative of the point is the lack of rational control of imagination in the work of Briffault. If he wants to disprove mutual aid in "Social Relations Among Animals," he cites data to show that they do not go in packs. If he has to admit that they form aggregations, he affirms that there is no trace of concerted action. If they are bound together, it is by their reproductive instincts. Without concerted action, nevertheless nursing and egg-watching are reciprocal. Although the data selected to disprove mutual aid show that animals do not go in packs, the data disproving monogamic trends show that they do go in packs. If he wants to prove that male jealousy is of a single female, he shows how male fish fight, not over the females, but over the eggs. If his hypothesis is a matriarchal trend among the animals, he proves that the males do not guard or battle for the young. Only the females do that, while the males fight only for the possession of all the females. And all these odd turns are made in the space of twenty-three pages.[58]

Scientific imagination always needs the critical service of reason as a factor in its control; otherwise, it is not scientific. It is probably too much the product of the factor next discussed.

[56] Eliot-Smith, *The Migrations of Early Culture* (Manchester, 1929), Preface.
[57] Sir Arthur Keith, *The Place of Prejudice in Modern Civilization* (London, 1931).
[58] Robert Briffault, *The Mothers* (one-vol. ed.; New York, 1931), chap. i.

B. Emotional Factor

According to Ribot, the creative imagination in all forms implies elements of feeling—*the emotional factor is strong.* He challenges "anyone to produce a solitary example of invention wrought out in *abstract.* . . . *Human nature does not allow such a miracle.*" And he continues:

> Suppose a man reduced to pure intelligence, i.e., to perceiving, remembering, dissociating, reasoning, and nothing else, creative activity becomes impossible because there is nothing to solicit it. Suppose, on the other hand, man reduced to sheer organic manifestations, i.e., motor activities lacking a sufficient cerebral organ, possessed of nothing but wants, appetites, instincts, emotions, and creative activity becomes impossible, because there is no insight. Hence the necessity of both the intellectual and the emotional factors in creative activity.[59]

Kurt Lewin has explained the emotional factor in imagination as operating in goal seeking as *valence.* However fictional *valence* may be as a psychological concept, it seems to take better account of the total situation than either the older concept of instinct or conditioned response. Perhaps it has more affinity with McDougall's newer use of the concept *propensity.*

Lewin says:

> Dynamically considered, the structure of the situation in which a child turns toward an occupation (as e.g., playing with a doll) because of interest in the occupation or task itself, is relatively simple. The situation is dominated by attraction, or as we shall say, by a *positive valence.* The child . . . sees a doll. Playing with the doll . . . possesses momentarily for the child a positive valence.[60]

There exists a positive psychical field force, a vector, proceeding from the child in the direction of the activity of playing with the doll. If this attraction is strong enough relative to the other psychical forces existing in the situation, an action of the child in this direction will occur.

> How does the child behave when such action in the direction of the attraction encounters difficulties? How does he act, for instance, when a bench blocks his progress toward the doll, or when an adult's prohibition or the sphere of power of another child, hinders his attainment of this goal? Psychologically, such a difficulty, be it physical or social, constitutes a *barrier* between the child and the doll.[61]

[59] Th. Ribot, *op. cit.,* p. 32.

[60] Kurt Lewin, "Reward and Punishment," an unpublished MS in the Duke University Library, p. 8.

[61] *Loc. cit.*

Then Lewin shows how the child tries to get around the barrier, or, in the case of an unpleasant task, may be driven toward it by punishment with an attempt to keep the child from "going out of the field" as it readily tries to do in conflict situations, and so on. But with methods of escape, extending even to flights from reality in conflict situations, we cannot be concerned. The principle of real interest here is goal-seeking and positive valence as a factor in creative imagination. It can be seen readily that such tensions are operative in the goal-seeking and general activity of all species, high or low.

Lewin takes no such position as we have seen that Holt takes with reference to goal-seeking. Striving is not the function of the external goal, but of a dynamic organism which makes valence possible, and which behaves in a total situation of an organismic nature. As J. F. Brown points out, the energy that causes a hungry man to quicken his step at the sight of a loaf of bread is not in the loaf of bread as stimulus. The tension is the source of energy, and, only when it is discharged, does the psychic energy return to a state of equilibrium. The tensions of lower animals are largely physiological; and this physiological valence spurred on Köhler's apes to the solution of the problems he set them. But human beings find valence in their relations to psychic goals, producing vectors clearly not physical in nature as Lewin and Brown make clear.[62]

In the attainment of goals, imagination becomes heightened and results in insights necessary to penetrate, surround, or overcome the barrier. The Thomas-Ellwood concept of active adaptation through crisis, attention, reflection, tension, insight, and control has been justified again and again.[63]

Lawrence Buermeyer shows how wholes dominate parts in artistic creations and contends that the forms which appear in art must ultimately go back to those which instinct makes appealing to the artist [further confirmation of artistic imagination as spatial-social] forms "which are spontaneously sensitive."[64] Probably the best illustration of all, however, of imagination rooted in psychic valence, is the case of a man who escaped from one of our Western state penitentiaries by cutting

[62] J. F. Brown, "The Methods of Kurt Lewin in the Psychology of Action and Affection," *Psychological Review*, XXXVI (1939), 200 ff.

[63] W. I. Thomas, *Source Book for Social Origins*, pp. 13-26, cited in Ellwood, *Cultural Evolution*, pp. 44-45, where Ellwood adopts but modifies the position of Thomas.

[64] Lawrence Buermeyer, *The Aesthetic Experience* (Merion, Pa., 1924 and 1929), pp. 94-97.

through the bars.[65] In a few months authorities captured him, brought him back, and gave him "the third degree" in an effort to find out where he obtained his saw. He insisted that he used no saw, but was finally tortured into demonstrating his means of escape. In his demonstration he took a piece of twine, dipped it in glue, rolled it in emery on a steel table, dried it, and told them he had cut his way through the bars in three and one-half months with emery-coated strings. Putting him out of reach of such devices, they were surprised to find that he was gone again in three and one-half years. This time he had picked threads out of his rough socks, wet them with saliva, dipped them in dirt, dried them against the wall, and with great persistency sawed his way through the bars after more than three years, keeping his work carefully hidden. How was he motivated?

(1) Prison life with its negative valence produced psychic field forces with the vector punishment operating in the rear of the striving organism.

(2) Escape possessed a positive valence with the bars as the barrier. The barrier and the negative valence resulted in a great emotional tension.

(3) He turned every device over in his mental processes to determine whether it would fit into the synoptic setting.

(4) His attention was oriented every minute toward any device that might fit into the desire-escape configuration.

(5) His quick intelligence was geared to seeing what he wanted to see, a new configuration including an appropriate escape mechanism.

(6) The positive valence of freedom resulted in the necessary perseverance he manifested.

(7) A flash of insight came to him, and, accompanying it, the reorganized configuration which has been referred to as synthetic vision. It was not a conditioned response, as defined by behaviorists, although he had been conditioned against prison duties; it was not trial and error, since he would have tried nothing except what his creative mind told him was relevant to the situation, and it really took imagination to see that the emery-coated string was relevant; and it was not a case of psychic accident, since he had never observed an emery-coated string sawing on steel. It was a plain case of valence and intellect: goal-seeking with insight entering into the solution of the problem.

[65] Joseph Rossman, *The Psychology of Invention* (Washington, 1931), tells the story.

The valence factor in imagination shows itself in the performance of many imaginal functions. It is strong in the development of meaning and symbolization. It is strong in the play of children, which may serve as an illustration of the dynamic purposiveness of the organism in the imaginative creation of symbolism and of meaning on the part of the child at play.

Professor Stern observed a child roll her apron into a *ball* and pretend to throw it; then immediately she wrapped it as a bandage around her *sore* finger, and then just as quickly she molded it into a *plate*. One minute she made a train out of four chestnuts; the next out of a row of building blocks; and the very next, of a yardstick which she dragged behind her. The boy is not disturbed that his broomstick horse has neither tail, head, nor legs. The valence of play immediately sets fancy to work in supplying the materials which *symbolize* and *mean* whatever the total situation makes them mean as it is organized about the goal.[66]

C. The Unconscious Factor

The unconscious factor of imagination has often been referred to as inspiration simply because of the suddenness and seeming impersonality of its functioning. Darwin thought that it is a process of "impressions" already in the mind combining without a conscious act of will in seeking such a combination. He believed, however, that deliberate attempts to find keys to the solution of problems result in such fruitful flashes of insight.[67] The unconscious factor is usually disposed of, however, by reference to the influence of hypnagogic states or dream consciousness upon the functioning of imaginal processes. Th. Ribot and John Livingston Lowes discuss the unconscious factor in their valuable works, and Lowes takes the position that it is explained by the creative activity of the imagination at work just on "the vestibule of consciousness." He affirms that he does not believe that any "conscious piecing together, however dexterous, of remembered fragments could conceivably have *alone* wrought the radiant forms which the *Mariner* [in Coleridge] saw." He believes rather that "the strange blendings and fusings which have taken place all point to one conclusion," involving "operations which are still obscure"; that there is an unconscious factor through which, just on the vestibule of consciousness, *"the imagination . . . the true inward creatrix,*

[66] William Stern, *The Psychology of Early Childhood* (New York, 1924), pp. 268-277.
[67] Charles Darwin, *The Descent of Man* (2d ed.), I, chap. iii, p. 106.

instantly out of the chaos of elements or shattered fragments of memory puts together some form to fit it." He takes such a position because he "cannot ignore the testimony of Coleridge himself . . . of Dryden . . . Goethe . . . Henry James and Henri Poincaré—all practiced and acute observers of their mental processes."[68]

V. Bechterev thinks that dream invention and somnambulism disprove the effectiveness of any conscious factor in human activity. He holds these facts support his view that "man's adjustment of his outer manifestations in relation to another being" involves no psychical process; rather these adjustments "are themselves outward manifestations." As a matter of fact, the dream itself would have no content but for a psychical process, which, after all, is what is reported; and he can hardly prove by the imagery of a dream-invention that the behavior of the dreamer, or of the somnambulist for that matter, is comparable to the behavior of a decerebrate frog wiping the acid off the back of its neck.[69]

Finally, what the dreamer has when he awakens is the *dream;* and he can only wildly guess at what has happened in the "engramatic traces."

[68] John Livingston Lowes, *The Road to Xanadu* (New York, 1930), p. 403.
[69] V. Bechterev, *op. cit.*, pp. 43-45.

CHAPTER V

FLASHES OF INSIGHT IN ARTIST, INVENTOR, AND SCIENTIST, AND GROUNDS OUT OF WHICH NEW FIGURES EMERGE

"Mendeleef was a dreamer and a philosopher He was going to find a key to all this heterogeneous collection of data."—Bernard Jaffe

"Svante [Arrhenius] had a keen pictorial faculty and a remarkable memory which helped him visualize the whole range of data he had collected during those two years at Upsala."
—Bernard Jaffe

"Avogadro kept teaching and experimenting He could handle a flask and a balance as well as a dream."—Bernard Jaffe

I. INTRODUCTORY

THE TENTH proposition in the generalizations of Chapter II contends that the achieving force par excellence in trait-initiating individual personalities has been and is controlled and creative imagination, which includes insight and makes learning by the conditioned response and psychic accident possible; that the latter theories, together with the theory of trial and error, are supplementary to, but cannot take the place of, learning by insight in explaining the difference between the world of *then*—the world of the Cromagnon man, for example—and the world of *now*.

It has been noted, however, that Walter Hunter, V. M. Bechterev, and others flatly reject the hypothesis of insightful learning and maintain that all the phenomena described under insight can just as well be placed under the heading of conditioned response. Nevertheless, the facts are so ample in support of the proposition that limitations of space prevent doing them justice here; but our samples, taken from spontaneous instances,[1] indicate strongly that, to explain the phenomena of learning, the hypothesis of insight is indispensable.

The reason for choosing spontaneous instances of learning is that, since we may view such cases in the light of the cultural preparation,

[1] Cf. Hornell Hart, *Technique of Social Progress*, p. 591.

the life history, the present situation, and the methods of persons to whom they occur, the experiences of artists, inventors, and scientists *in real life situations* may be better evidence than the behaviors of rats, cats, chimpanzees, and even human subjects in psychological laboratories.[2] Hence, (1) the insights, (2) the backgrounds, and (3) the methods of artists, inventors, and scientists in search of insights will form the subject matter of this chapter.

II. FLASHES OF INSIGHT IN ARTIST, INVENTOR, AND SCIENTIST

A. Art and Insight

Lester F. Ward maintained that art consists of detecting the defects in nature, supplying the missing elements first in imagination, and then creatively supplying them in some concrete, objective way. The artist, he held, "can put nothing into his picture that he has not seen in nature," but he takes "the perfect parts of many imperfect models and combines them in one in which all the parts are perfect. This is the essence of creative genius," which not only *reconstructs* but *constructs* anew.[3]

Lawrence Buermeyer holds that "it is possible to treat the whole of the expressiveness of art as residing in the form." That this is true, he says, appears in the fact that "a face," for instance, "is just the face it is because of the disposition of the features, the size of the eyes, the distance between them, the curves of lips and nose, [and] the proportions of the forehead." Even the complexion is formal "in that it depends upon color contrast and not mere color."[4]

The artist, then, according to Buermeyer, does not create matter but forms. Absolute creation is not possible; but he recreates forms never conjoined in the past; and his originality consists of finding clues which the unimaginative, stereotyped mind could never find and following them up to bring order out of chaos.[5]

Whatever Ward's or Buermeyer's theory of art may lack, these men

[2] To appeal to spontaneous instances of learning is not to discredit attempts at studying learning in the laboratory. Many valuable laboratory experiments on learning have been conducted by Morgan, Thompson, Hobhouse, Pavlov, Kohler, Tolman, Yerkes, and others working with animals, and by Maier, Ebbinghaus, and others working with human subjects. Laboratory studies may get away from introspective reports in human subjects, but not away from the subjective elements in experimental set-ups or from the subjecuve aspects of the observation of behavior during experimentation.

[3] *Pure Sociology* (New York, 1903), p. 82.

[4] Lawrence Buermeyer, *op. cit.*, pp. 94-97.

[5] See quotation from Roger Fry, footnote in chap. iii.

open the way for a consideration of the mental processes of the artist in esthetic creation in which we shall see that, whether he is poet, painter, sculptor, or musician, the creative artist has a remarkable ability for bringing order out of chaos through experiencing flashes of insight which organize his materials into form; that often these illuminations occur suddenly and at the oddest times and places—frequently in a hypnagogic state or during sleep.

Some of the greatest poets have had such experiences. Samuel Taylor Coleridge possessed a marvelous power of synthesis in these dream states and could produce a masterpiece of art upon awakening from a dream. He composed *Kubla Khan* in a dream one day in the summer of 1797. As Lowes relates it, the poet went to sleep reading materials suggestive of his dream. During his slumber he composed two or three hundred lines, which rose before him as *things,* "with a parallel production of the correspondent expressions [a dramatic-cinematic process], without any sensation or consciousness of effort." On coming out of his dream state, he wrote down a part of the poem, which was preserved perfectly as a whole in his memory; but, being called away on business, he forgot the rest.[6] C. G. Jung gives a number of cases of a similar nature from the poetry of Miss Miller in *The Psychology of the Unconscious;*[7] and Hornell Hart outlines a number of experiences related by literary men in general in which creation by sudden uprushes of insight took place.

> Longfellow said of his ballad, "The Wreck of the Hesperus," that "it did not come into my mind by lines, but by stanzas." In Goethe, creation was instantaneous, often being produced on awakening. . . . Dickens heard his characters speak. Hugh Walpole has often felt as if he were merely recording the actions and experiences of characters who have an independent existence and simply reveal themselves to him. Edith Wharton admits that similar tendencies on the part of her characters have always baffled her. Bernard Shaw said: "The play develops itself. I only hold the pen. My procedure is to imagine characters and let them rip. . . . The result always shows that there has been *something behind* all the time of which I was not conscious, though it turns out to be the real motive of the whole creation."[8] And we may add that Robert Louis Stevenson dreamed Dr. Jekyl and Mr. Hyde.

Painters have the same experiences as literary men. James Tissot was painting a series of pictures representing the social life of Paris. One of

[6] J. Livingston Lowes, *op. cit.,* p. 19.

[7] *The Psychology of the Unconscious,* trans. Beatrice M. Hinkle (London, 1924), pp. 28-50.

[8] *Living Religion* (New York, 1937), p. 168.

the series was "The Choir Singer." One day he went to church in order to get atmosphere for this painting. What he came away with, however, was the complete motive and outline of another painting; for, as he closed his eyes during the devotions, he saw some strange figures moving among the ruins of a modern castle: an old peasant and his wife throwing down the one bundle of their possessions to rest on a broken pillar; then a figure of Jesus after the Passion, with all the marks of the Crucifixion, coming and seating himself beside them. Out of this experience came Tissot's painting of "The Ruins."[9] Tissot had similar visions in other pictures; and so had Martini.

Musicians likewise have experiences of illumination with insight. Mozart often dreamed, or heard as a whole while awake, entire compositions in a second's time; and Giuseppe Tartini, the inventor of the modern violin bow, "dreamed that the devil had become his slave." In his dream, he tried to fool Satan by giving him a dream violin to play. To his great surprise, the devil played a "sonata of such exquisite beauty as surpassed the boldest flights of my imagination." When Tartini awoke, he wrote "The Devil's Sonata."[10] Hoffmann often told his friends, "When I compose I sit down at the piano, shut my eyes, and play what I hear." Haydn's conception of "The Creation" was a composition he imaginatively heard with a vividness so real that he attributed it to inspiration.[11]

In sculpture, Lorado Taft conceived the statue of "Black Hawk" as expressive of "the soul of a dying race, its fine spirit of bravery, patience, endurance, poetry, aspiration, sorrow," while standing on a high bluff above Rock River, near Oregon, Illinois, "in a contemplative attitude, restful, reverent."[12]

These flashes of insight are readily paralleled in the field of invention, to which we turn.

B. Invention and Insight

In *The Sociology of Invention* S. C. Gilfillan[13] gives little support to, if he does not implicitly deny, the hypothesis that similar processes are at

[9] Henry E. Jackson, *Great Pictures as Moral Teachers* (Philadelphia, 1910), pp. 73-77.

[10] Donald Laird, "Putting Dreams to Work" (condensed from the *American Weekly* of Aug. 25, 1935), *Magazine Digest* XI (1935), 110-112.

[11] Hornell Hart, *Technique of Social Progress*, p. 586.

[12] Krueger and Reckless, *Social Psychology*, p. 221.

[13] Chicago, 1935.

work in the field of invention; for the numerous principles of invention he advances make little room, except in one or two grudging propositions, for the concept of insight as a major factor in invention. His list, modified for the present purpose in order and form and classified into subgroups, is given below.

Sources of Invention

(1) Inventions occur through accretions of little details rather than through a series of creations; (2) they constitute complexes of diverse elements (3) as new combinations of ideas previously known, (4) but are not necessarily based on a prior science. (5) They are not the result of the work of individual genius; (6) yet they are the deliberate work of men of intelligence and moral character, with motives for inventing, free time, and ample mental and mechanical equipment. (7) These persons belong to a "numerous inventor class"—(8) great inventors are a myth—who perceive the need of such inventions. (9) Need and not accident is the leading principle of invention; and (10) inventions are inevitable when the time is ripe, as indicated by (11) parallel inventions.

Factors Facilitating Invention

(12) Inventions become easier with the advance in the number of available concepts. (13) They are facilitated by changes growing out of the achievements of inventors, the development of wealth, education, population, and commercial organization. (14) Invention increases in rate as devices become practical propositions. (15) Specialization of labor favors invention; and (16) so does industrial expansions.

Factors Restraining Invention

(17) Standardization in a firm discourages inventions which would change the standard form, and (18) revolutionizing inventions are made by individuals outside firms rather than by firms with standard equipment. (19) Patrons put a check on inventors by their conservatism, therefore, (20) if an invention comes before its time, it is practically useless; and (21) although it may serve any sort of felt need, (22) its acceptance depends upon its meeting felt needs. (23) The growth of capital and the use of durable materials are enemies to invention.

Organization for Invention

(24) Inventors have enterprize partners; and (25) leading firms invent along their lines.

Types of Invention

(26) Men working separately often make very different inventions for the same purpose, yet at about the same time. (27) Inventions may be empiric, theoretic, unconscious, evolutionary, epochal, individual, groupal, accidental, or deliberate in type.

The Natural History of an Invention

(28) Inventions arise when attention-attracting changes act as triggers; (29) but an invention declines in use almost from the start of its practical success. (30) It reduces its own importance as it "saves" anything, (31) outlives its usefulness, and (32) is rarely rejuvenated. (33) The greatest use of each invention is in its "fountain lands"; (34) it improves with use, (35) has its own predictable trends, and (36) evidences its perfection in beauty.

While Gilfillan's objection to a more dynamic theory seems rather mild, he still follows Ogburn and fails to take account of much of the data bearing upon the psychology of invention.

Joseph Rossman, United States Patent Examiner, classifies the types of inventors and describes the "actual methods of inventing." According to his classification, inventions may be physical, social, or mental. They may be combinations of old elements into new things as inventions proper, or they may be discoveries, or new-found facts. Scientific research often makes discoveries which invention may follow, whether the investigator has this purpose in mind or not. Even scientists invent their research equipment.[14]

Dr. Rossman asked 710 inventors, "What are the characteristics of a successful inventor?" The frequency of characteristics noted from the replies were: perseverance, 503; imagination, 207; knowledge and memory, 183; business ability, 162; originality, 151; common sense, 134; analytical ability, 113; self-confidence, 96; keen observer, 61; and mechanical ability, 41. If one takes the trouble to add the frequencies of imagination, originality, analytical ability, and keen observer, he finds the total frequencies for these replies to be 532, which really stresses greatly the intellectual factor in invention. The 503 replies designating perseverance indicate the presence of tension and goal valence.

According to the 710 inventors, invention follows these distinct steps:

[14] Joseph Rossman, *op. cit.*, pp. 1-41; cf. L. L. Bernard, *Introduction to Social Psychology* (New York, 1926), p. 165.

(1) creative persons observe a need or difficulty relative to some problem of control; (2) they analyze the need; (3) they make a survey of all available information on the subject; (4) they formulate all objective solutions that present themselves; (5) they make a critical analysis of these solutions to discover their advantages and disadvantages. Then follows (6) the birth of the new idea, and (7) experimentation to test out the most promising solution.

According to Rossman, "The first and most essential step" in invention is the recognition of a need, "latent or incompletely satisfied," which constitutes the spark that incites the activity of the inventor. The problem may have often been dealt with objectively, but remains unsolved. Then, suddenly, a new pattern appears, new relations are discovered; and the resultant conception "that is greater than the sum of its parts" is the invention.[15]

The times at which such conceptions flash upon the inventor are as varied as among artists: alone in the bathroom, at the theater, during a sermon, late at night, or early in the morning. B. W. Castleman looks at a newspaper item while shaving; the lather on his face dries in flakes, and he gets insight into a new process of making light, airy soap chips.[16] Charles V. Boys "created the new fool-proof device for measuring gas consumption when his mind was apparently asleep." Awakening in great excitement from a dream he hastened to his laboratory to make real his dream machine.[17] The discoverer of the method of making flaked cereals had to pay a patient ten dollars when she broke her false teeth eating a prescriptive dry food. That set him to thinking. One night soon after, he dreamed about the process of making the flakes, but was awakened to perform an emergency operation before he had finished the dream. On going to sleep again after the operation, he finished his dream, the effective results of which he demonstrated the next morning in the hospital kitchen.[18]

Thomas A. Edison often depended upon the creativity of his hypnagogic states of mind. "When stumped by something he would stretch out in his Menlo workshop and, half-dozing, have the idea come from his dream mind to help him around the difficulty."[19]

[15] Joseph Rossman, *The Psychology of Invention*, pp. 1-41; cf. L. L. Bernard, *Introduction to Social Psychology* (New York, 1926), p. 165; cf. E. T. Hiller, *Principles of Sociology*, pp. 344-345; cf. F. H. Hankins, *An Introduction to the Study of Society* (rev. ed.; New York, 1935), pp. 427-429.

[16] Rossman, *op. cit.*, p. 51.

[17] Laird, *op. cit.*, pp. 110-112.

[18] *Ibid.*

[19] *Ibid.*

Edison and his inventing colleagues have not depended altogether on dream states and other odd situations for their creative work, of course; but sudden illuminations seem to be very frequent, whatever the situation. Edison created the phonograph in a single day in 1877. Years before a then-forgotten phenomenon occurred while he was experimenting upon the idea of sending telegraph signals from a whirling disk upon which a stylus pricked electromagnetic embossed telegraphic dots and dashes, creating a musical hum when the disk whirled at high speed. In 1877 he developed a funnel-like toy. When he talked through the funnel, the vibrations caused by his voice worked a pawl which turned a ratchet wheel connected by a pulley with a paper figure of a man operating a paper saw on a paper log. "Edison noted that at times the man moved rhythmically, at times jerkily, depending upon the words shouted at the horn and the pitch of the voice."[20] Out of the setting of the musical hum, noted years previously, and the industrious paper man sawing on his paper log came the flash of insight which produced a phonograph in thirty hours.

"F. R. Upton remarked that one of the main impressions left from knowing Edison for so many years was 'the marvellous accuracy of his guesses.'" Another inventor, who had struggled for a long time over the problem of "the proper way of constructing a prism for a binocular microscope—and having given it up, suddenly hit upon the solution while reading an uninteresting novel."[21] And Watt's hypothesis for his steam engine came to him while he was taking a walk. Before his walk ended, "he had solved the incidental problems and worked out the invention in mind."[22]

C. The Scientist and Insight

The "uprush" of scientific hypotheses evidencing the factor of learning by insight is to be found in all fields of science. Physicists, mathematicians, biologists, and all the rest have had experiences which justify Havelock Ellis's estimate of the value of imagination in artist and scientist alike when he writes:

> We have to recognize that the true man of science is an artist. Like the lunatic, the lover, the poet . . . the student is "of imagination compact." It was by his wonderful imagination . . . that Newton was constantly discovering

[20] E. S. Bogardus, *Leaders and Leadership* (New York, 1934), pp. 234-235.
[21] Hornell Hart, *Technique of Social Progress*, pp. 563-564.
[22] *Loc. cit.*

new tracks and new processes in the region of the unknown. The extraordinary life work of Helmholtz . . . scientifically precise as he was, had . . . an aesthetic coloring. There is no such thing as an unimaginative scientific man. . . . Artistic ideas like that of the steam locomotive, the flying machine heavier than air, the telegraph, the telephone, and many others . . . were at the very moment of their being achieved elaborately shown to be "impossible" by men who had been too hastily hoisted up to positions of "scientific eminence."[23]

Ellis holds that Einstein is an artist who owes more to Dostoievsky than to Gauss or any other scientist.[24] What Ellis seems to mean is that scientists, like artists, must, in order to be creative, have powers to perceive, to visualize, with selective attention to significant interrelations of parts within wholes, configurations of reality with insight into the principles that organize those configurations.

It was no accident that Newton discovered the principle of gravitation. Walter Franklin Prince tells us that Newton often solved problems in dreams;[25] that the "basic ideas underlying his discoveries came welling up in flashes of insight when his conscious attention was relaxed."[26] The same process manifested itself in the creative work of Kekule, both in the development of the structural theory of the atom and in the discovery of the benzene ring theory. In the case of the first, Kekule had been visiting in the London home of a friend and was riding home on the outside of the last omnibus through deserted streets. Falling into a revery, he saw atoms flitting before his eyes, two coupled together, with larger atoms seizing the smaller ones, then still larger atoms seizing three and even four smaller atoms, all whirling around in a bewildering dance, the larger atoms forming a row and dragging still smaller atoms at the end of the chain. Arriving at home, he spent the night writing down sketches of these revery pictures of the "structural theory."[27]

At the time of the discovery of the benzene ring theory, Kekule was working on a textbook with his mind on other things. Turning from his desk toward the fireplace, he fell into a hypnagogic state of mind, with the same atoms flitting again before his eyes, long rows of them assuming serpentine forms. All at once, one of the serpents seized his own tail "and whirled mockingly before his eyes." Flashing awake at once, Ke-

[23] Havelock Ellis, *The Dance of Life* (New York, 1933), pp. 72-73.
[24] *Ibid.*, pp. 135-136.
[25] *The Psychic in the House* (Boston, 1926), p. 32.
[26] Hornell Hart, *Technique of Social Progress*, p. 565.
[27] Walter Libby, "The Scientific Imagination," *Scientific Monthly*, XV (1922), 263-270.

kule spent the remainder of the night writing down the benzene ring theory.[28]

After much experimentation, Arrhenius suddenly crystallized his new theory of electrical conductivity and paved the way for the chemistry of ions. "I got the idea," he says, "in the night of the seventeenth of May in the year 1883, and I could not sleep that night until I had worked through the whole problem."[29]

Helmholtz, in an address on his seventieth birthday, "described the way in which his most important thoughts had come to him." He said that

> . . . after previous investigation of the problem in all directions . . . happy ideas come unexpectedly without effort, like an inspiration. . . . They have never come to me when . . . I was at my working table. . . . They come . . . readily during the slow ascent of hills on a sunny day.[30]

Henri Poincaré believed that the distinguishing characteristic of mathematical discovery is "apparent sudden illumination." After spending several weeks "trying to demonstrate that there could exist no function analagous to those [he later called] the fonctions Fuchsiennes," he had a sleepless night in which ideas crowded his mind. "I felt them knocking against each other," he says, "until two of them hung together, as it were, and formed a stable combination. In the morning, I had established the existence of a class of fonctions Fuchsiennes. There remained merely to set down the results, and that was done in a few hours."[31]

Sir William Rowan Hamilton said of his discovery of the Quaternions:

> The Quaternions started into life, or light, full grown, on the 16th of October, 1843, as I was walking with Lady Hamilton to Dublin, and came up to Brougham Bridge, which my boys have since called Quaternion Bridge, that is to say, I then and there felt the galvanic circuit of thought close; and the sparks which fell from it were the fundamental equations between i, j, k; exactly such as I have used them ever since.[32]

[28] *Loc. cit.*

[29] Bernard Jaffe, *Crucibles* (New York, 1930), pp. 222-223.

[30] Quoted in Graham Wallas, *The Art of Thought* (New York, 1926), p. 80.

[31] Henri Poincaré, *Science and Method*, trans. Francis Maitland (New York, 1915), pp. 52 ff.

[32] R. P. Graves, *Life of Sir William Rowan Hamilton* (2 vols.; Dublin, 1882), II, 434-436, quoted in Hornell Hart, *Technique of Social Progress*, p. 565.

It is well known that Darwin got the idea of natural selection as the method of evolution while reading the population essays of Malthus;[33] and even V. Bechterev, who disclaims the effectiveness of any psychic element in learning by insight tells us that he has been able "to observe the same process [of creativeness during sleep] in [himself]."

> It happened several times when I concentrated in the evening on a subject which I had put into poetic shape, that, in the morning, I had only to take my pen, and the words flowed, as it were, spontaneously. I had only to polish them later.[34]

In the field of biosociology, Karl Pearson's notable work on *The Chances of Death* had its inception in the mind of the writer in 1875 while he was standing on the old wooden bridge at Luzern, which was decorated with pictures of "The Dance of Death." There it occurred to him that

> . . . something might be done to resuscitate the medieval conception of the relation between Death and Chance and to express it in a more modern scientific form. It is only within the last year that I have reached such a generalization of the theory of Chance that I have been able to work out my theory of 1875.[35]

Karl Pearson's stress on quantitative measurement in scientific research, his emphasis on the data of sense impression, and his statistical attempts to keep his scientific feet on the ground, in spite of his evident failures sometimes, remind us that the imagination of the scientist may, however, be too free, too much without control, and that "insights" without data, without background, may be fantastic—in short, not insight at all, but illusions.

Coleridge knew that even the artist could not depend upon imagination running wild, that poetry must have a logic of its own, "severe as that of science, and more difficult because more subtle and more complex."[36] Yet there is enough difference between the manner of imaginal control in science and in art that the scientist may let his imagination run too much to poetry. For instance, in a book on *Genius and Creative Experience,* the author, N. D. M. Hirsch, writes:

[33] Cf. Eduard Lindeman, *Social Discovery,* with Introduction by Herbert Croly (New York, 1925), pp. 25-26.
[34] *Principles of Reflexology,* p. 44.
[35] Karl Pearson, *The Chances of Death and Other Studies* (London, 1897), pp. 10-11.
[36] I. A. Richards, *Coleridge on Imagination* (London, 1934), p. 1.

The germ plasm has lived millions of years at least; it is perpetually experiencing, for all life, as distinguished from inorganic matter, endures—lives with and through the past. In our own lives we are the total of all our past experiences. . . . We are ever growing older like the universe of the immortal Bergson. So too the germ-plasm; it is literally the heir of all the ages of germ-plasm experience, and the germ-plasm is living, experiencing as much as we, and in like manner. The germ cells have sexual yearnings, pugnacious tendencies, and they create; mutations are their darlings. . . . The germ cells are like immortal princes confined and they no more than the princes are satisfied with their sister cells. So both princes and princesses ignite their castles by the flame of love; which although ultimately destructive of the existing castle, builds mightier and higher ones from their very flames and ashes.[37]

Such a passage displays imagination and some degree of esthetic appreciation, but it smacks to a slight extent of privacy. Art may be impressionistic, while, as we have mentioned, such a privilege is scarcely open to the scientist, however much he may learn from impressionistic data. Hirsch possessed impressionistic empathy, but not true insight.

Imagination in the scientist aids him in clear expression, if he possesses such capacity, because of the clarity of his ideas; and ideas are the essence of his subject matter—the forces which set the laboratories humming with activity. But laboratories must also hum with activity to play a very important part in the development of the experimental ground out of which new figures emerge, as we shall see in the next section.

III. GROUNDS OUT OF WHICH NEW FIGURES EMERGE

The cultural preparation, the life experiences, and the present situations of persons whose insights represent creative activity are very important in the interpretation and the understanding of the illuminating flashes outlined above. For, just as verification must follow the work of the imagination, a vast amount of cumulative experience must come before it; for, in general, it may be said that all creative minds work against a background of rich experience out of which their newly discovered configurations emerge. As long as culture simmers with less data present together in any one mind because of lack of intensity in intermental interaction, creative activity lags; but when culture begins to boil in intensity of interaction over wide areas, as it has in the last fifty years, then creative activity speeds up.

If one looks into a history of inventions such as Beckmann's of a hun-

[37] Cambridge, Mass., 1931, p. 61.

dred years ago,[38] and compares it with a recent one, say by an American with such a name as Waldemar Kaempffert, on *American Inventions*,[39] or with *The Wonder Book of Inventions*,[40] an English production, he will be struck by the great difference in the subjects treated. In the book one hundred years old, the story is told of the origins of such things as Italian bookkeeping, music-noting machines, gold-refining, the domestication of canary birds, magnetic cures and secret poisons, wooden bellows, coaches, pineapples, sealing wax, corn mills, saffron, alum, falconry, artichokes, sawmills, stamped paper, adulteration of wine, street paving, chimneys, cork, apothecaries, clocks, quarantine, paper-hanging, writing pens, buckwheat, saddles, stirrups, horseshoes, lace, butter, steam engines, pawnbrokers, chemical names of metals, mirrors, soap, tin, fire engines, indigo, gilding, fur dresses, steel, forks, lotteries, foundlings' hospitals, orphans' houses, guns, cock-fighting, and book censors.

The book of American inventions is filled with the story of the revolution of transportation, communication, and power machines; with the description of machines for exploiting such natural resources as iron, steel, copper, silver, gold, oil, coal, forests, farm and soil products; and with accounts of automatic labor-saving devices in making machines, clothes, and shoes. Thomas A. Edison and his phonograph grace the first page, while, in the English book of inventors, one of the first illustrations is that of "The Machine Man." "This 'robot' will move its arms, turn its head to either side as directed, and perform other actions. The voice of the person giving the orders causes sound waves which set the necessary mechanism in operation." The remainder of the book is full of descriptions of gas masks, diving suits, ice rinks, skyscrapers, rescue parties for miners the members of which are equipped with oxygen breathing devices, the making of sound films, rocket planes, amplifying devices, man-catchers on trucks, rocket cars, television, racing machines, ocean liners, the wonders of wireless, the cinema, hair-waving machines, giant generators, gyroscopes, autogyros, zeppelins, X ray, radio activity, mapping from the air, endurance flights, ultraviolet rays, infrared rays, motor tractors, caterpillars, counting, sorting, and adding machines, giant excavators, linotype machines, cranes, steam shovels, tunnels, looms, deep sea

[38] John Beckmann, *A History of Inventions, Discoveries, and Origins*, trans. from the German by William Johnston (2 vols., 4th ed.; London, 1846).

[39] Waldemar Kaempffert, *American Inventions* (New York, 1924).

[40] A. M. Low, *The Wonder Book of Inventions* (London, n.d.).

diving, recent railway inventions, "harnessing the elements," and "weighing the worlds."[41]

Thus is demonstrated the way in which the imagination of the later inventors has profited by the background of the earlier achievements. But the earlier achievements were not reached without a high degree of imagination and were by no means small. As O. T. Mason[42] has pointed out, along with Charles H. Judd,[43] man was far from merely borrowing his original culture patterns from nature. But his comparative lack of cumulative experience made invention and scientific discovery for him a difficult process; a process popularized by A. G. Keller as *Man's Rough Road*.[44]

After the rough road of cultural preparation has been covered in a given population, it still remains to be understood why some persons make discoveries and inventions while others do not; why this individual makes that specific contribution to the stream of culture rather than turning his attention in some other direction.

The orientation of the individual initiator of cultural traits, as already stressed but to be more closely analyzed later, can be understood only in the light of the fact that any scientist, inventor, or artist, like everybody else, behaves in evolving total situations of which he is himself an integral part; that he lives in the dimension of social space as a possessor of a certain status and the performer of a given function, and in the dimension of social time, with the past flowing through him into tomorrow; that the nature of his contribution, if any, and the significance of it, will depend upon his total life-situation as it evolves in the total groupal-situation as *it* evolves; that, as a "link in the chain of social transmission," his impress is felt through the fact he does not transmit the cultural stream flowing through him in just the way he receives it. The modifications he introduces might consist of erroneous transmission, of accurate transmission with the slightest modification, or of transformations of enough importance to change the trend of centuries. But his work is always the result of the manner in which an individual life fits into the social life of his group, or groups, in which his experiences have oriented his attention toward certain specializations that he has pursued. In the pursuit of

[41] *Ibid.*
[42] *Origins of Invention* (London, 1895), pp. 18-19.
[43] *The Psychology of Social Institutions* (New York, 1926), p. 10.
[44] New Haven, 1932.

these specializations, he has developed a strong personal attachment to the attainment of specific goals—inventions, scientific discoveries, artistic ideals—which will not let him alone until he has achieved them.

The tension that is thus generated in the life-situation of the person seeking a scientific goal is well attested by what Sir William Rowan Hamilton said about the big moment of his discovery of the Quaternions:

> I pulled out on the spot a pocket-book, which still exists, and made an entry, on which *at the very moment* I felt it might be worth my while to expend at least ten (or perhaps fifteen) years to come. But then it is fair to say that this was because I felt a *problem* to have been solved—an intellectual want relieved—which had haunted me for at least fifteen years before.[45]

That illuminating insights cannot be snatched out of thin air needs no proof. That they emerge out of such backgrounds as just suggested has ample proof in the realm of science as well as that of invention. But to show how creative insights emerge out of the interweaving factors of cultural background, personal interest, and imagination, we shall let specific instances of inventions stand for the same process in scientific discovery until the latter is discussed more fully in the chapters on Galileo, Darwin, and Comte.

The present purpose may be achieved by turning to a very brief review of the lives of such men as the Livingstons, Thomas Blanchard, Samuel F. B. Morse, Charles Goodyear, John Ericsson, Cyrus McCormick, Benjamin Tilghman, and Ottmar Mergenthaler, about each of whom the salient features of background, orientation, and achievement are given in the fewest possible words.[46]

The background of John and Robert Livingston was that of engineering. Out of their experience in this background and their imagination came the T-rail, the screw-propeller, a sectional boiler, and many other traits to fit into the complex of transportation.

Robert Fulton was a poor widow's son who could not learn from books "because his head was so full of his own ideas." In his youth he studied art under Benjamin West, who had been a friend of his father,

[45] R. P. Graves, *loc. cit.*

[46] These instances are taken from George Iles, *Leading American Inventors* (New York, 1912). They can be supplemented very greatly by appealing to Ralph Henry Curt, *The Story of Discovery and Invention* (New York, n.d.); Joseph Mayer, *The Seven Seals of Science* (New York, 1927); Walter Libby, *The History of Science* (New York, 1917); Bernard Jaffe, *Crucibles* (New York, 1930); and the numerous stories of scientific achievement as told by Paul de Kruif.

sketched every sort of thing—a friend's likeness, a landscape, a mechanical pattern—and tinkered constructively with all sorts of devices. He became interested in boats at the age of fourteen on a fishing excursion. In England, while traveling as an artist, Fulton met Lord Stanhope, "a man of paper projects." Lord Stanhope meant to equip a steamboat with a web-footed propeller to swim like a duck. Fulton saw at once that a boat could not swim like a duck because of the resistance offered by the forward stroke. But out of his more constructive insights the latter not only made the steamboat practical but invented double-inclined planes to use in carrying ships over land from one stream to another. He foresaw communication as a national unifier, invented torpedoes, various diving boats (including the famous *Nautilus*), and many other things. As in the case of the Livingstons, his inventions ran along the same line of endeavor.

Eli Whitney was a farmer and mechanic who had found his interests driving him to creative tinkering during his youth. Graduating from Yale University at twenty-seven, he went to South Carolina to teach school. Here, the salary was so low that he refused to keep school and went instead to live in the home of Mrs. Nathaniel Greene. While there he read law, invented new devices for the household, and, although he had never seen any cotton until the need was brought before him, created the cotton gin.

Thomas Blanchard, who produced his original lathe in 1822, manifested a talent for building and contriving "almost from the cradle." The neighboring blacksmith shop was an inspiration to him to produce a forge of his own, which he fired with coals stolen from his mother's kitchen grate. His father, who could not make a farmer out of him, admonished him to become a good blacksmith! He invented, besides the lathe, a fruit-parer, a tack-counter, and a tackmaking machine. His brother said that such a machine was impossible, because "it takes a knack to make a tack," and "no machine can do it." Later, he developed his woodbending machine and his lathe to turn gunstocks.

His interest in the latter resulted from overhearing a journeyman, who was watching a Blanchard cam at work, say to a shopmate, "Well, Blanchard can't take my job away from me, for I turn gunstocks." To himself Blanchard said, "I am not so sure of that. I'll think it over." The longer he thought about it, the more he believed that such a lathe was feasible. One day,

. . . while manifold schemes for this machine were afloat just below the conscious level of his thought, he was driving home through Brimfield. . . . In an instant there emerged to his imagination a hinged carriage to hold a feeling wheel, and beside it, a twin cutting and copying wheel. He cried, "I have got it!"[47]

A passerby, hearing this exclamation, said to his comrade, "I guess that man is crazy." In a month's time Blanchard had perfected a lathe to turn a gunstock so neatly that a sandpaper retouch was hardly necessary.

It has been said that Samuel F. B. Morse "owed much, nearly everything indeed, to a succession of inventors from Galvani to Henry"; yet, with all his indebtedness to the past and his contemporary assistance, he remained a commanding mind in the development of the telegraph. As in the case of so many other inventors he was an artist. As a student at Yale he had been a reader to President Timothy Dwight. When chemistry came in he studied chemistry. Later he carried on a miscellany of activities such as devising a sculpturing machine, painting, experimenting in electricity, and working on the idea of the telegraph. And it was he who had the requisite drive, background, and imagination to put the telegraph into operation (1836-1838) and, with the assistance of Alfred Vail (d. 1859), to develop the Morse code.

Charles Goodyear (b. 1800) was educated as a hardware apprentice. He first entered business as a partner with his father in manufacturing buttons, spoons, scythes, clocks, and forks. Later he became a banker and, failing, spent ten years in prison for indebtedness. While in prison he occupied himself with tools at a workbench. When he came out of prison, he began, because he had often noticed the defects in rubber goods, to seek a process for vulcanizing rubber. This he accomplished by what, after a fashion, proved to be an accident as a by-product of using nitric acid to clean a piece of gum-elastic after the bronze ornamented piece had been boiled in lime. But it was to Charles Goodyear in search for a method of vulcanizing rubber to whom the accident happened.

John Ericsson (b. 1803) was the son of an educated Swedish owner of a small mine. In his boyhood he whittled out many toy machines with a jackknife. In his early days he associated with canal builders, studied chemistry, graduated at a technological school, and became a captain in the Swedish Army. Later he studied guns and worked as a shipbuilder in France and England. In 1829 he built a locomotive that would run

[47] *Ibid.*, p. 113.

thirty-two miles an hour. Then, after a period of service as a superintending engineer, he came to America where he turned his versatility to account in the same notable way as in Europe. Among the many things achieved in America, in 1862 he built the celebrated ironclad *Monitor*. In the same year in New York he constructed a solar engine.

Christopher Latham Sholes, who invented the Remington Standard Typewriter, was a printer and a newspaperman who spent many years experimenting with new machines in his field; and Cyrus McCormick's father, himself an inventor of farm machinery, was a farmer on an eighteen hundred acre farm, where Cyrus was born in 1809.

Elias Howe had many predecessors. Among them was Thomas Saint, who, in 1790, had created a chain-stitch sewing machine. Exercising the insight of a genius, Saint made a machine with a good overhanging arm, horizontal cloth plate, and continuous thread-tighteners above and below the needle. Although it was superior to all other patents until Howe came along, Saint's creation was forgotten for sixty years because the public was not ready for it.[48] Why did Howe succeed where others failed?

Howe was born in 1819 to a family of inventors. In his boyhood he took part in all sorts of handicrafts. Once he heard a man say that the inventor of a sewing machine would gain a fortune. He determined to do it. Well acquainted with spinning frames, power looms, and the like, he perfected the invention; but there was, in 1848, still no demand for it, even when he demonstrated that it could sew faster and better than five seamstresses. It took many years to sell the idea to the public.

Benjamin C. Tilghman (b. 1821), after graduating from the University of Pennsylvania, was admitted to the bar but refused to practice. Instead he traveled widely to visit many shops and laboratories. After coming home from his travels, he took up the study of chrome ores and perfected the production of steel shot which would cut granite twice as effectively as sand. Soon after the Civil War, in which he became a general, he again took up his interrupted experimentation.

One day, while experimenting with sulphurous acid, dissolved in water, he aimlessly bruised a burnt match stick into the liquid. The next day he noticed that the wood had become mucilaginous and looked like paper pulp. At once he asked: Can this solution convert wood into material for paper? His success in demonstrating the process solved the problem of a paper shortage, which was accompanied by prohibitive prices

[48] *Ibid.*, p. 338.

on all sorts of available paper. Again an accident had occurred; but it was significant only to a creative mind that had given attention to a prevailing need as an orientating situation.

Tilghman's crowning insight, perhaps, was the development of the sandblast as an underived invention after seeing "a jet of sand impelled by steam escaping at high pressure; its remarkable effect induced him to repeat, as an experiment, what he first beheld as an accident." But it was no accident that he soon discovered the fact that "a blast of sharp sand wrought as deep an incision in one minute as windblown sand in a year." He showed that he could "cut a hole one and one-half inches wide in a slab of corondum one and one-half inches thick in twenty-five minutes."[49]

Ottmar Mergenthaler, whose father was a teacher in Germany, turned down one apprenticeship after another in his youth to become a clockmaker. Coming as an immigrant to the United States in 1872, he set himself up in Washington as a maker of clocks and bells. Some years later his attention was drawn to the problem of the linotype by Charles T. Moore's unsuccessful model of a "writing machine"; and between 1883 and 1884 he succeeded in carrying the development of his linotype through to completion.

Reference after reference in this chapter has shown the part played by imagination in the creative mind in the process of reshaping the world. Insight as the method par excellence of learning is very clearly indicated in the samples given. Tilghman's invention of the sandblast as well as many others cannot be explained solely on the basis of psychic accident, trial and error, or conditioned response. All that can be said for the force of the latter factor is that the person is conditioned by the total situation to look for the item that will complete the desired configuration; but the recognition of that item, as well as the direction of the search, is the work of imagination. At the same time, as June Downey suggests, we have seen that "inspirations" occur "strictly within the limits of the individual's capacity, training, and previous cogitations"; that "Hamilton the mathematician and not . . . Byron the poet" made the "famous discovery of the quaternions"; that " 'Kubla Khan' was dreamed by Coleridge," and "the benzene theory by Kekule the chemist."[50] Yet, while these discoveries have not come as flash-ups from the unconscious, as "chance explosions occurring indifferently in feeble-minded or genius," they nevertheless have

[49] *Ibid.*, pp. 381-386.

[50] June Downey, *Creative Imagination* (New York, 1929), p. 158.

been revealing insights which the world could hardly do without; and they have come out of rich imagination directed and controlled by methods of creation rather than out of sheer fumbling experimentation.

IV. THE METHODS OF CREATIVE WORKERS

Many of the "spontaneous" instances we have cited may, on first thought, seem to indicate that the creative person in art, science, or invention has no method of directing and controlling either his imagination or research activities in the quest for his data and understanding. That, however, can scarcely be true in the cases given. Every case indicates that insights emerged when the persons having them were in a state of relaxation; were, in short, to use the terminology of E. C. Tolman, carrying on the very minimum of "practical behavior";[51] when they were, in fact, not even doing the kind of "running-back-and-forth" which Tolman attributes to both rats and men as the content of conscious awareness.[52] And, in many cases, at the moment of the emergence of the insight, they were not even "making a feint at running back and forth," which is the definition that Tolman gives to ideation.[53] When Kekule discovered the benzene ring theory, for example, he was working on a textbook with his mind on other things—not the textbook and presumably not the benzene ring idea. When Tissot got his idea for "The Ruins," as we have seen, he was sitting in church with his eyes closed. When Lorado Taft conceived the statue of "Black Hawk," he was standing atop a lofty bluff, looking over the landscape, "contemplative," but "restful, reverent." When Leonardo da Vinci was trying to work out a difficult problem, he sat for long periods of time quietly in the presence of his work.[54] When M. M. Goldstein, an electrical inventor, lies in complete darkness, he

[51] *Purposive Behavior in Animals and Men* (New York, 1932), p. 208.

[52] *Loc. cit.*

[53] *Ibid.*, p. 210.

In the pages from which these citations have come, Tolman is describing the behavior of a rat with some acquaintance with bifurcated passage ways leading, with one color differentiation to food, with another to no food, or some other kind of stimulus. If the rat, without any hesitation, runs the full length of one of the alleys, as he probably did to begin with, that would be "practical behavior" whether he obtained the food or not, or sheer trial with either success or failure. If the rat hesitated at the point of choice and ran back and forth into this alley and that before it finally traversed the full distance of one chosen path, this would be an indication that the rat's behavior—not the "raw feel" of conscious awareness but the behavior itself—constituted consciousness of a choice to be made. If the rat merely hesitates, remains still, and then moves down the chosen path toward the food, that is ideation—and insight.

[54] John La Farge, *The Gospel Story in Art* (New York, 1926), pp. 225-227.

sees intricate wire diagrams on ceiling or wall as an aid to his inventiveness. And, as indicated above, Helmholtz had none of his important ideas come to him at his work table. These ideas came rather while he was making "the slow ascent of hills on a sunny day." In fact, we have but to recall the entire list of cases cited to know that there was a minimum of that very kind of behavior the cessation of which in a young orangutan caused Yerkes to believe that the animal had solved the problem with insight or understanding.[55] It had ceased "running back and forth."

The evidence indicates that no amount of "running back and forth" will bear fruit without insightful imagination,[56] however much the former may be considered infallible by "the weighers of atoms."

In an editorial in the *New York Times,* entitled "Imagination Vindicated,"[57] the writer tells us how, in 1815, Dr. William Prout, "knowing nothing of isotopes, by sheer power of imagination, postulated a world in which hydrogen was the fundamental stuff and thus set chemists to weighing atoms." After much weighing with "accuracy . . . rarely achieved, they dismissed Prout's doctrine." But, in spite of their decimal fractions in atomic weights, causing wonder that round numbers were so rare, "we know the answer now" as the weighers did not. "The elements are mixtures; the atomic weights are only expressions of averages. Prout was right. Nature does not work in decimal fractions. . . . The physician and philosophical chemist, Prout, achieved more by sheer power of imagination than the weighers of atoms."

Prout had ceased mere rushing about.

Of course no scientist or theorist believes in following the "practical behaviors" of rats in search of goals of discovery. There are many who put in claims, however, for "running back and forth" as almost the sole method of exploration; at least, they minimize learning by insights arising out of the control and direction of imagination.[58] The creative scientist, however, not only indulges in much exploratory behavior of the physically active sort but makes a "feint" at doing so. Sometimes, failing in that, he ceases all attempts at the problem and gets the answer when not expecting it. Perhaps this fact was T. E. Stribling's reason for flying in the face of many geographers by saying that the hypnagogic states of the South and

[55] Tolman, *op. cit.,* p. 200.

[56] See above, p. 53 n.

[57] Dated Jan. 12, 1936.

[58] Tolman, *op. cit.,* chap. xxi, for the names of many who reject the hypothesis of learning by insight.

of the tropics should be the most creative of all. To this theory Donald Laird tells us that many others agree.[59]

The creative scientist in the process of discovery, according to Graham Wallas, goes through four stages: (1) the stage of preparation in which he collects his data; (2) the stage of incubation, in which, like Coleridge, he puts the data down into the "deep *well* of the *Unconscious,*" as Lowes describes it, where goes on the process of cerebration, organization, and integration, which results in (3) the emergence of insights, *if the total situation is favorable to their emergence,* followed (4) by the verification of the illuminating ideas of the third stage.[60]

R. A. Baker and Washington Platt made a report of a study of "hunches" among scientists, which gives additional support to Wallas's theory. This report was given at the meeting of the American Chemical Society in 1931, summarizing "conditions under which creative hypotheses spring into consciousness." Of 1,450 scientists they questioned in the study, nearly 200 reported having experienced sudden insights into "problems in which the thinker was intensely interested."

> Typically these sudden flashes of genius follow long periods of study, but come into consciousness at a time when the scientist is not consciously working on the problem. Many scientists deliberately cultivate conditions favorable to "hunches by following intense application by periods of relaxation, abstraction, or attention to other matters."[61]

Evidently these men had gone through the period of preparation, had given ideas time for incubation, and, as a result, had "hunches" emerge suddenly which were fruitful in verification.

It is surely possible, if so much has been achieved by the creative scientist in spontaneous situations favorable to the emergence of illuminating ideas, that more scientific investigators, inventors, and artists—in short, all creative thinkers as Graham Wallas[62] and Hornell Hart suggest—could make conscious use of the principle of relaxation, of "meditation"; could benefit by the "contemplative," "restful" attitude of Lorado Taft, with the attention fixed on the problem to be solved but with no straining at the solution. At least the cases show that it is more fruitful to alternate

[59] *Op. cit.*, pp. 110-112.

[60] Graham Wallas, *The Art of Thought* (New York, 1926), chap. iv; cf. Hornell Hart, *Skeptic's Quest* (New York, 1938), pp. 84-85.

[61] Hornell Hart, *Technique of Social Progress*, p. 566.

[62] *Op. cit.*, pp. 86-107.

"running-back-and-forth" with "feinting" at doing so by using constructive imagination.[63]

[63] If there are those who wonder why more is not said about the neurological events connected with "flashes of insight," it can be answered that we do not know very much about them. As a matter of fact, we know very much more about the "raw feels" of our insights, our sensations, our images, than we do about Tolman's factor of the "initiating physiological state . . . which may happen to be active at the moment"; and since we do, I fail to see why these "raw feels" do not get into our behavior and, as a result, get into our science. Tolman says that his task as a psychologist "can, in large part, be performed in relative ignorance of both physiology and neurology" (*Purposive Behavior,* p. 416). If he can get along without physiology and neurology as a purposive behaviorist, we ought to be able to proceed in the present study without going into the details of physiology and neurology. Cf. chaps. xiii, xvi, and xxv in *Purposive Behaviorism.* Incidentally, Tolman has some incisive criticism to make in chaps. xxi-xxii of the theories of learning by trial and error and by the conditioned-reflex.

CHAPTER VI

IMAGINATION IN SCIENTIFIC INVESTIGATION

"Imagination, [Paracelsus] . . . says, is more powerful than elements or stars. Whoever designs to do anything makes for himself a new heaven in which the work proceeds which he has decided to do."—Quoted by C. Delisle Burns

"I want to say a word about measurement. . . . There has been a lot of foolishness connected with this attempt to measure everything. There is, for example, this statement of Lord Kelvin's carved outside the window of this building: 'If you cannot measure, your knowledge is meager and unsatisfactory.' Its practical meaning tends to be, 'If you cannot measure, measure anyhow.' . . . Measurement is a technique for forcing objectivity on estimates. . . . Measurement is a different kind of thing for every different kind of thing you measure. . . . The only magnitude that can be measured definitely is the magnitude of space."—Frank H. Knight

I. INTRODUCTORY

IMAGINATION is the method of hypothesis, and hypothesis is an indispensable aspect of scientific method. For the field in which the scientist works is a hypothetically constructed field. The problem he attacks in that field is given a hypothetical definition. His concepts are hypothetical constructs of the imagination. Imagination leads him to hypothetically relevant data, sets up his methods of observation and experimentation, and throws the light of hypothesis upon orderly classification. It proposes that certain techniques will measure or serve as indicia of the phase of reality being studied, applies the techniques, and interprets the results. It formulates the generalization which is referred to as a theory or law. And this theory or law is either a hypothetical explanation by factors of causation or a description of concomitants and sequences.

Hypothesis is thus the step that every scientist necessarily begins and ends with. But when so many other scientists have agreed with his formula that it is accepted as verified, by consensus the statement comes to be known as a theory. Verification is, however, itself a mental process which creates, criticizes, and validates whatever techniques and methods of measurement it uses. For measurement itself must be measured—by

the mind; for the time will never come when quantification will quantify itself independently of the mind which is creative enough to attempt the construction of measures of its own behavior and sometimes lacking in a large enough measure of creativity to believe that it has completely succeeded.

It might even be said that hypothesis is *the* creative aspect of scientific method.[1] Yet, we find some would-be scientists crying, "Don't think, try!"[2] and a modern philosopher saying that in ideal science there should be no hypothesis; that "it is a sheer waste of time to frame any hypothesis before all the facts that can be ascertained are in hand, and, by that time, the truth will usually be apparent." He thinks that science is dispensing with hypotheses as guides in research and ceasing to ask leading questions, merely "letting the facts speak for themselves."[3] He seems to realize, however, how important it was for Pasteur to be able to catch the significance of facts long before others could, as he advanced his discoveries.

Ballantine's ideal scientist would not have pleased Darwin, who believed that Carlyle, for instance, was incapable of advancing the cause of science because of an utter lack of scientific and social imagination. He considered Buckle too unimaginative to know what to do with his encyclopedic knowledge; and so believed Huxley and Spencer.[4] Goldenweiser, comparing the scientist with the poet, the dreamer, the artist, says that "a scientist who is no longer capable of framing a hypothesis—or never was—is not a scientist but a methodological fossil"; and he affirms that the true scientist "lies awake nights with his conclusions before transforming them into demonstrable results." Gauss, for example, being asked when he expected to get his mathematical conclusions, "replied

[1] Those who do not realize that hypothesis is the outstanding method of science to which all techniques are to be applied, should spend some time surveying the field of hypothesis in social science, especially, in order that they may realize how extensive it is. Let them begin anywhere they will, as in the case of the writer. Several days spent in the compilation of a list of hypotheses, theories, formulas, explanations, hunches in social science ran into such huge numbers that it became evident that the project would require a separate work to state them, to say nothing of the very slightest elaboration, assuming that one had sufficient knowledge even to list them.

[2] Cf. C. A. Ellwood, *History of Social Philosophy* (New York, 1938), the "Epilogue"; also, H. E. Barnes and Howard Becker, *History of Thought from Lore to Science* (2 vols.; New York, 1938), II, 997-1001.

[3] W. G. Ballantine, *The Logic of Science* (New York, 1932), pp. 160-162.

[4] Francis Darwin, *Life and Letters of Charles Darwin* (New York, 1898), p. 64; cf. Herbert Spencer, *An Autobiography* (London, 1904 and 1926), p. 4.

that he had them long ago, all he was worrying about was how to reach them."[5] And according to press reports, Einstein has affirmed that hypothesis and not quantification is the principal method of science. That he is right has already been attested by the "vindication" of the imagination of William Prout, whose hypothesis of atomic weights was so long ago disputed by the weighers of the atoms.[6]

To sum up the value of hypothesis, Karl Pearson spoke clearly years ago in a single paragraph in the *Grammar of Science* on the function of imagination in research. That one paragraph, however, shows his appreciation of imagination as being "at the bottom of all great scientific discoveries." He is reminded that, after an elaborate classification of facts has been made and their relationships and sequences traced, the next stage in scientific investigation is the use of the imagination in the construction of a formula "from which the whole group of facts is seen to flow." The construction of such a statement, however, "is not the work of a mere cataloguer, but of a man endowed with creative imagination."[7]

Pearson delays hypothesis to much too late a stage in the scientific process as it is viewed here, where it is seen as mapping out every step the scientist takes; and it is by following this proposition throughout this chapter that we shall demonstrate the function of imagination in scientific investigation. But we must first observe the various types of hypotheses that may be advanced and inquire into the nature of hypotheses that are likely to give helpful rather than misleading orientations to the man of research.

II. THE CLASSIFICATION OF HYPOTHESES

Hypotheses may be classified as (1) tentative, (2) conditional, (3) descriptive, (4) fictional, (5) analogical, and (6) explanatory. The tentative hypothesis is serviceable as an original and fact-gathering hunch; or there may be a number of tentative hypotheses in the mind nearly all of which are discarded before overt observation and experimentation have begun. The conditional hypothesis, prefaced by "if," is a device for reasoning by which one seemingly causal relation after another may be eliminated until the field of probable explanations or leads is narrowed

[5] Alexander Goldenweiser, *Robots or Gods* (New York, 1934), pp. 47-49.

[6] See p. 108 above.

[7] Third edition, sec. 11; cf. D. S. Robinson, *Principles of Science* (New York, 1924), p. 291.

down. The descriptive hypothesis may be in the nature of a proposition without reference to causation.

Fiction and analogy require some special attention. As Vaihinger says, the wise man does not avoid hypothesis; and we may further agree with him that neither does he avoid fictions,[8] but he must know how to use them.[9] The same thing is true of analogy. H. B. Workman blames the Greeks for reasoning by analogy;[10] but who is not guilty of doing so at times? Social scientists are often offenders. They mistake an illustration for causal explanation; and illustration is the only service analogy can perform outside of suggesting other similarities than those known or already seen to exist between bodies of phenomena. Thus they may become exploratory hypotheses; but Lester F. Ward, long ago,[11] and, more recently, P. A. Sorokin[12] have driven home in a devastating way the fallacy of analogy as causal explanation or as descriptive of social reality.

We find ourselves joining Ward and Sorokin in their amusement over these fallacious analogies; yet we often commit the same faults ourselves. Even C. M. Child writes on "The Biological Foundations of Integration" in terms that hark sharply back to such analogies. Polarity, symmetry, transmission, communication, transportative correlation, barter, exchange, commercial relations, and many other comparisons made between society and the organism in Child's essay are valuable, but in the light of all the concepts it entertains, it seems unfortunate that he named his article "The Biological Foundations of Integration."[13]

[8] Marie C. Swabey, *The Logic of Nature*, p. 253. As Swabey defines a fiction, it is "a provisional construct of the imagination, which does not claim to be a description of the objective world. Examples of such fictions are familiar to all of us . . . timeless instants, potential energy, curved space. . . . Many of them are held to have proved extremely fruitful in science and practical life; and as such, to have justified themselves by virtue of the problems they have helped to solve."

[9] Swabey seems inclined to distrust fictions; but Hans Vaihinger, *The Philosophy of "As If,"* trans. C. K. Ogden (London, 1924), p. 89, has shown us how valuable, if sometimes misleading, even fictions may be. He has outlined them as (1) the fiction of artificial classification, (2) neglective fictions, (3) schematic fictions, (4) paradigmatic fictions, (5) Utopian fictions, and (6) type, (7) analogical, (8) juristic, (9) personificatory, (10) summational, (11) heuristic, and (12) ethical fictions.

[10] H. B. Workman, *Christian Thought to the Reformation* (London, 1911), p. 25.

[11] Lester F. Ward, "Contemporary Sociology," *American Journal of Sociology*, VII (1902), 484-487; Ward made a list of forty-four organic analogies. He drew on Spencer, Lilienfeld, Worms, Comte, Schaeffle, Ludwig, Stein, Ratzenhofer, DeGreef, Giard, Novicow, Bernes, Tarde, Garofalo, Fouillee, and others.

[12] P. A. Sorokin, *Contemporary Sociological Theories*, chap. iv.

[13] C. M. Child, in E. W. Burgess (ed.), *Personality and the Social Group* (Chicago, 1929), pp. 16-34.

Has Child made an advance on Spencer? He has, but only in the fact that his concepts more clearly illustrate the real nature of society. Of course, the center of the organism dominates the periphery and the periphery influences the center, just as similar processes take place in society; and the organic theorist may be critical enough to say that *organism* is *genus* and *society* a *species* different in kind from *biological organism;* but that brings up the question of two entities, *abcde* and *ecdba* or *act* and *cat.* Here we have exactly the same components in perfect integration in each constellation; and yet, whether we say they belong to the same genus or not depends upon the disparity of the classes of objects or systems with which we are comparing or contrasting them. *Abcde* may constitute a sail and *ecdba* a clown's costume, made of the same elements fitted together differently; and both costume and sail may function perfectly, each for its purpose; yet, element-for-element comparisons can be made in the two systems. Suppose now we take *cat* and *cad.* The components *c* and *a* belong to both, but as *d* enters into one and *t* into the other system, the two assume vastly different meanings —probably as different in objects represented as in the two words that make up the compared series. So also in the case of organismic or organic societal analogies.

Perhaps those who now distrust hypotheses have in mind largely the mistakes of fictions and analogies—or rather the misuse of fictions and analogies and the tendencies of so many social scientists to deal in them. As Jevons says, the hypothesis must meet a number of tests in order to avoid such mistakes. It must be conformable to experience or attainable by the intensification in imagination of experience of a rational kind. If it is an explanatory hypothesis, it must cover all the facts in the case, and it must be the simplest explanation that has been suggested. It must allow of the application of deductive reasoning "and the inference of consequences capable of comparison with the results of observation; and it must not conflict with any laws of nature or of mind, which we hold to be true."[14] Furthermore, "the consequences inferred [must] agree with facts of observation" already known, though they may be in complete disagreement with the theories already existent in a given scientific field.

When hypotheses measure up to these qualifications, they form an indispensable aspect of procedure in research. In fact, hypothesis-creating

[14] W. S. Jevons, *The Principles of Science* (London, 1924), pp. 504-511.

imagination has developed all the theories that have risen in a given science since the emergence of the earliest outlines of the field; and indeed without such imagination, these outlines, early or late, faint or clear, could never have appeared. Thus we may see in the following section that any scientist finds the problems he would investigate emerging hypothetically out of a hypothetically constructed and evolving field.

III. IMAGINATION AND HYPOTHESIS IN AN EVOLVING FIELD

To enlarge upon the proposition stated above, we may say that any field of science emerges synoptically as a hypothetical whole out of which new wholes emerge. That is, it moves from the generalized to the specialized. The "architectonic vision" of creative minds working together makes possible synoptic perceptions of great ranges of related data. These synoptic perceptions lend themselves to analysis through creative reasoning. Analysis yields insights; and these insights make possible the reintegration of knowledge gained through specialization—through the study of component configurations—into more closely differentiated and greatly enriched new wholes. It is thus that synopsis moves through analysis and insight to synthesis in any field of science; but since sociology is one of the youngest of the sciences, we may take its development as a pure case demonstrating the process."[15]

[15] To indicate the significance of synoptic perception in the emergence of the sociological field, we may, as G. A. Lundberg does, in *Social Research* (New York, 1929), p. 11, quote Stuart Chase, who, in beginning his study of *The Tragedy of Waste*, imagines what can be seen in an aeroplane ride across North America. But let us also imagine an "objective" observer from Mars riding with a sociologist, being sure to ask how what he sees differs from what the near-earthbound sociologist sees and to remember that what is synoptic vision for the Martian, who yet has his separate fields and intricate relations to discover, is already synthetic vision for the sociologist with whom he rides. Says Chase:

"He would see only the farms, the forests, the mines, the railroads and highways, the rivers, canals, transmission lines; the factories, warehouses, stores, schools . . . homes; the behavior of some 100,000,000 men, women, and children in relation to these things; men digging and plowing, pulling the throttles of engines, balancing on steel girdles . . . bending over desks . . . jamming people into elevated train doors, fishing on the high seas . . . yelling at ball games . . . love-making, going to church . . . pacing in striped suits through prison corridors. Women minding spindles and babies and cooking stoves . . . drinking tea, smoking cigarettes. Children answering the school gong . . . working in cotton mills, tossing with fever . . . a vast conglomeration of human activity."

Lundberg observes the complexity of such a conglomeration of phenomena, takes the position that complexity is only lack of understanding, and indicates how the observer can begin to pick out certain patterns and routines, such as eating, sleeping, and going to church. But Lundberg, as well as Markey, refuses to make a distinction between the manner of observing physical and social phenomena. The validity of such a position, however, would seem to require that the Martian, coming to the earth as an observer limited to the same method of studying men, mountains, steam shovels, and trees, should

Before Comte invented his hierarchical theory of the sciences, sociology had not appeared as a separate whole. And years later (1904), Karl Pearson still wondered whether the field was too inchoate to justify the organization of an English Sociological Society.[16] He seemed not to appreciate the work of Comte. At the same time he said that there would not be a field of sociology with definite boundaries until its subject matter had been synoptically envisioned by a man of genius. Sociology had been lacking in a genius, he believed, such as Descartes, Virchow, Darwin, Newton, or Pasteur, each of whom he considered the creator of a distinctive field of research. Because of this view, Victor Branford accused Pearson of being a metaphysician, who overlooked the forerunners of each of these men; and Branford affirmed that Comte, Spencer, Vico, Condorcet, and LePlay were the equal of any of them.[17] McQuilkin DeGrange probably has more appreciation of Comte than either Pearson or Branford as he writes: "Order, precision, architectonic vision, philosophical power, synthetic unity—such were some of the characteristic qualities that Comte brought to the task of consciously creating a new science, a life-long progress."[18]

Comte had segregated out of the totality of reality, as far as he viewed it, a field of knowledge the study of which was the business of sociology. He did not go further toward specialization than the dichotomy of social statics and social dynamics, a step which, as DeGrange tells us, assumed for him no great importance, since he said that any significant division of the field must wait upon an adequate conception of the whole.[19] Spencer's ranging vision swept the whole horizon, and he envisioned a synthetic philosophy which included sociology as one of its units; yet his pioneering led him into some real errors. Accepting the organic theory of society, he did not know that cultural data appear in

be as good a sociologist as either Lundberg or Markey, and yet he could not even get into what Markey has termed "the symbolic process" as an outsider. Without doing so, he could not turn "the symbolic process of acquiring knowledge . . . upon the symbolic process . . . just as it can be turned upon physics or chemistry or mathematics" (*ibid.*, pp. 14-15). He could divine nothing of what man, who is carrying on so many activities, thinks he is doing; could not know how the other feels, and could understand very little of "the tragedy of waste." Since he could not, then Markey and Lundberg, with better opportunities, have failed to make a distinction in fields of reality, physical and social; an omission which merely results in scrambling two fields of knowledge rather than simplifying them.

[16] *Sociological Papers,* I (1904), 25-42. [17] In *Sociological Papers, loc. cit.*

[18] Analysis I, p. 33, in Stuart A. Rice (ed.), *Methods in Social Science* (Chicago, 1931).

[19] *Ibid.*, pp. 34-35.

Gestalten, the meaning of whose parts are determined by the whole. Hence attempts on his part to segregate fields of social study could not well have followed the bodies of data possessing the true field properties of society.[20] But it took real imagination to apply the organic theory of society.

Specialization had to come later; for the fields of social knowledge are determined by the field properties of society as a whole that is more than the sum of its parts; and the laws of learning make it necessary for larger wholes to appear before the related wholes forming parts of the total configuration can appear. They require, therefore, imagination in the process of segregating the new configurations, clarifying, developing, and reinstating them in an enriched, new whole, greater and more inclusive than the configuration growing out of the original ground of knowledge. The old Gestalt has not been replaced by a number of new Gestalten unrelated, but by new Gestalten which become and *are* field properties—functionally related parts—of the expanded body of knowledge in a given field as a whole.[21]

All the fields of social research, then, are field properties of society, imaginatively discovered and functionally related because the bodies of data that compose them are so related. It is necessary to specialize, to handle one piece of an evolving puzzle at a time; but imagination must view the separate pieces in the light of trends and in the light of what is already known of the whole as an ever-changing-until-complete structure before we can make any progress; such is the evolving jig saw of social knowledge.[22]

When one turns, however, to the fields of sociology as listed by L. L. Bernard, he may become a little doubtful as to whether each field named has been clearly segregated out of the greater whole by its followers; for the list includes historical, biological, rural, urban, folk, cultural, and political sociology; the sociology of art, religion, law, institutions, economic relations; the study of the community and the family; geography, social psychology, social psychiatry, social ethics, social organization, social control, social pathology, social work, social investigation, and social statistics; and demography, penology, criminology, and delin-

[20] A. L. Porterfield, "Imagination in Social Research," *Sociology and Social Research*, XX (1936), 224.

[21] *Loc. cit.*

[22] *Ibid.*, p. 225; the last three paragraphs are given practically as they appear in the writer's article here cited.

quency.[23] And if the reader is thinking about complete delimitation of fields of data, he will be right in supposing that such boundaries have not been established. If, however, he considers each of the fields named as being organized about certain problems, he will see that fieldness is the property of the problems about which the data revolve, and that the problems require specialization.

While specialization is required in the attack upon specific problems, wise specialization must wait upon some knowledge of a field as a whole. Bernard has suggested that "the true sociological investigator can work more efficiently, as the worker ants and bees work, if he becomes socially desexed, or emasculated, as it were," and at the same time a "specialized worker who is conditioned in the direction of analysis rather than that of synthesizing or generalization." He believes that "it is useful (at least within limits)" for him to specialize, "just as it is useful (also within limits) for the generalizer and the reformer to be more concerned with the use of sociological data than their discovery."[24] Of course Bernard is right in keeping both the specialist and the synthesist within limits; and we may add that the survey of laboratory specialist or specialized generalizer either achieves nothing without a catholic vision and a broad scholarship which enables him to see where he fits in and the significance of what he is about in the light of the whole.

If, however, the social scientist sees the field whole; sees the great society as made up of groups; sees both patterned structure and a well-defined process; sees origins, unities, continuities, disunities, orderly, and catastrophic change,[25] all against a background of physical, cultural, biological, and psychological forces or variables, he is then able safely to specialize and to see clearly what his problem is and where it belongs. In fact, it is only in the light of such vision that any real scientific problem can emerge; and it is only by seeing parts in the light of the whole that the investigator can understand how his problem came to be, what forces operate in it, whether these forces can be controlled, what ought to be done with them if they can be controlled, and how man can do

[23] L. L. Bernard (ed.), *The Fields and Methods of Sociology*, p. 12.

[24] L. L. Bernard, "The Great Controversy . . . ," *Social Forces*, XIV (1935), 66; cf. Florian Znaniecki, *Methods in Sociology* (New York, 1934), pp. 266-267; cf. Clark Wissler, "Anthropology," in Wilson Gee, *op. cit.*, p. 94; and A. Goldenweiser, "Anthropology and Psychology," in W. F. Ogburn and A. Goldenweiser, *The Social Sciences* (New York, 1927), pp. 69-86; also J. Livingston Lowes, *op. cit.*, pp. 54-55.

[25] See the leading concepts in C. A. Ellwood, *The Psychology of Human Society*.

what he wants to do with these operating forces. With these things in mind, he not only sees clearly his problem but is able to make use of multiplied, undigested data already at hand because of multitudinous surveys already conducted;[26] data which never had any real significance to many of the surveyors themselves.

With these principles clearly in mind, the scientist will find specific and concrete problems emerging (1) as the result of the rise of new divisions of evolving fields, (2) in the need for cultivating the "no man's land" between recognized fields, and (3) in the process of splitting off problems from other related problems in a given specialization of a given field.

IV. IMAGINATION IN CREATIVE OBSERVATION

When his particular concrete problem has been chosen, and the nature of his data has been determined, the investigator is next faced with the method to be pursued in gathering his data. In the beginning, rather than supposing that he must be free from, he must know that he will have to be full of anticipation as to what data will be relevant to solving his problem. He may wish to "begin with collecting the facts"; but, as Morris Cohen exclaims, "Aye, but what facts?"[27] Moreover, when Ballantine pleads for "letting the facts speak for themselves" after they "are . . . all in hand,"[28] he overlooks the fact that *facts* are themselves hypothetical. The sociologist Durkheim gave a whole chapter to answering the question, "What is a social fact?" before he wrote on "rules for their observation"; and he came out with the hypothesis that *"A social fact is every way of acting, fixed or not, capable of exercising on the individual an external constraint; or again, every way of acting which is general throughout a given society, while at the same time existing in its own right independent of its individual manifestations."*[29]

With this view of facts, Durkheim's whole sociological system becomes something very different from the systems of other writers with different views of social facts. Indeed, whatever the field of study,

[26] Allen Eaton and Shelby M. Harrison, *A Bibliography of Social Surveys* (New York, 1930), probably give the most significant surveys up to 1928. Much valuable information has been gathered in surveys since 1930; but when will it be synthesized?

[27] Morris Cohen, *Reason and Nature* (New York, 1931), pp. 76-77.

[28] *Loc. cit.*

[29] E. Durkheim, *Rules of Sociological Method*, trans. Sarah A. Solovay and John H. Mueller (8th ed.; Chicago, 1928), chap. ii; cf. Walter W. Cook, "The Possibilities of Social Study as a Science," *Essays on Research in the Social Sciences* (1931), pp. 27-48, and Kimball Young, *Source Book for Sociology* (New York, 1935), p. 318.

"factness" in itself, in either physical or social science, depends upon the configuration to which the items belong as parts of a whole which makes them what they are as objects of scientific interest. Their relation to the configuration makes facts relevant.

But relevant facts do not label themselves as relevant. Facts, in the light of the principle enunciated above, vary greatly in their importance, as E. W. Allen stresses, some being sterile, while others are pregnant;[30] and the possession of powers of visualization will save the necessity of an investigator's groping for something significant in whatever fortuitously shows up in his dragnet.

Furthermore, as he observes his facts, he cannot do so with the "glassy eye," which, as Morris says, "angelically beholds a ready made world."[31] What is discovered will not depend so much upon what is in the object as it will depend upon what is in the subject. True enough, the subject often attributes to the object what is not there; yet, whatever is there, in physical science, will never be known as being there without the presence of the subject, the dynamic observer. We could have no science if the mind were merely a *glassy eye.*

This glassy eye could never visualize "tactics," "strategy," or "statecraft" in scientific research;[32] could never ask a leading question or do any significant observing; it would never observe, as Darwin did, enough facts far away from coral reefs to produce a trustworthy work on their origin. He called this work on *Coral Reefs* the most deductive of his works, did much reading for it, and thought it out on the West Coast of South America, where he made observations on the deposition of sediment which he could "replace in his imagination . . . by the upward growth of corals."[33] The glassy-eye mind could never see in the process of observation what Louis Agassiz saw in his studies of the "Gordius."[34] Only those who follow Bacon and his methodological kinsmen praise the glassy eye. Huxley contended that the Baconian methods were fruitless.

[30] E W. Allen, "The Nature and Function of Social Research," *Publications of the American Sociological Society,* XXI (1927), 236-238.

[31] C. W. Morris, *Six Theories of Mind* (Chicago, 1932), pp. 304-305; cf. Joseph Jastrow, *Psychology, Fact and Fable,* chapter on "The Mind's Eye"; cf. Vivien M. Palmer, *Field Studies in Sociology,* chap. i; cf. R. S. Woodworth, "Psychology," in Wilson Gee, *op. cit.,* p. 156.

[32] R. S. Woodworth, "Psychology," in Wilson Gee, *op. cit.,* refers to strategy in planning research campaigns, statecraft in choosing worth-while problems, and tactics in handling details.

[33] *Life and Letters,* p. 58.

[34] L. Agassiz, *Methods of Study in Natural History,* pp. 62-66.

This conviction of the fruitlessness of the Baconian method arose in Huxley's mind not later than 1859, the date of the *Origin of Species*. Leonard Huxley tells how his father often heard men say, concerning the *Origin*, "Oh, but this is contrary to the Baconian method!" As a result, he came to feel "that Bacon's 'majestic eloquence and fervid vaticination' . . . were yet, for all practical results on discovery, 'a magnificent failure.'"[35] If the Baconian method of observation should bring complete objectivity, that objectivity would, in Comtean terms, come as near to idiocy as perfect subjectivity would to madness; for, as Goldenweiser says, "facts have no meaning except the meaning attached to them by a mind."[36]

V. OBSERVATION BY EXPERIMENTATION

Creative observation, which gives meaning to facts, follows three principal procedures, one of which is more appropriate to physical science, one of which may be used in either, and one of which is open to use only in the social sciences. The one more appropriate to the physical science is experimentation; the one open to both is the observation of samples; and the one open only to social science is sympathetic observation which goes forward by the contacts of minds through imagination.

In physical science, the method of observation par excellence, of course, proceeds by experimentation, every aspect of which is controlled so thoroughly that the procedures can be repeated to the very last item by anyone who cares to do so. Yet, the set-up of the experiment, the equipment used, and the success of the procedure depend entirely upon the dynamic and imaginative quality of the experimenting mind, as can be seen in the description of "one laboratory table."

> On that table there is nothing spectacular, nothing making the slightest noise, nothing brighter than a fifty watt lamp; only a rather complicated system of glass tubing and some measuring instruments, looking much as they have looked any time in the past twenty years, and yet from that table have come the following things: first, the Mazda lamp, which annually saves the public many millions in its lighting bills, makes workshops and streets brighter and safer at night, and adds to comfort and convenience in many ways; next the high-vacuum power tube, the heart of the broadcasting system . . . [and] the flonated filament which gave the radio receiving tubes a much higher efficiency; and finally, atomic hydrogen welding.[37]

[35] Leonard Huxley, *Life and Letters of Thomas Henry Huxley* (London, 1900), I, 486.
[36] *Robots or Gods*, p. 86, after reference to Comte.
[37] L. V. Redman and A. H. Mory, *The Romance of Research* (Baltimore, 1933), p. 9.

If, as Carl Murchison says, "the greatest comedian in science is that person who periodically breaks out in print or speech to reflect that experimental work is all important," while the discussion of ideas is of secondary importance,[38] he becomes even greater as a comedian if he happens to be working in social science, where experimentation is so difficult because it is next to impossible to achieve effective controls and to find any "constants" that are not variables. At this point Joel Chandler Cobb states boldly, nevertheless, that experimentation is entirely possible in the social sciences and that "as a matter of fact we are experimenting all the time"; and he even goes so far as to say that every law, police regulation, educational change, even civilization itself, is an experiment![39] Yes, but it is an experiment with not a sign of a control group, no controlled variables, and no possibility of repetition under the same conditions.

Suppose that we grant the validity of experimentation without qualification in the social sciences. In that case, we may still amply demonstrate the value of imagination in experimental set-ups, which are good or bad, as controls for observation, with the goodness or the badness of the imaginal process; and we may do so with specific instances drawn largely from the pages of Gardner Murphy's *Experimental Social Psychology*.[40]

Experimenters have been confronted with the question as to whether there are patterns of behavior which constitute or represent definite innate emotional responses. In examining this question, Watson got a hunch which led him to set up certain experiments with babies; and he, Jones, and others have observed infants carefully to determine their earliest responses of various kinds. Sherman challenged Watson's picture of the organization of infant behavior by asking experienced and inexperienced observers to interpret the responses of babies, sometimes letting the observer see the stimulus and not the response, other times the response and not the stimulus, and sometimes both. He imagined experimental set-ups that Watson did not conceive. Feleky pioneered in trying, by experimentation with 86 photographs of an actress presented to 100 subjects, to determine whether there are innate patterns of facial expression.

[38] Carl Murchison, *Social Psychology* (Worcester, 1929), p. viii.

[39] Joel Chandler Cobb, "A Study of Social Science Data and Their Uses," *American Journal of Sociology*, XXXV (1929), 80-92. [40] New York, 1931, chap. ii.

Guilford studied the process of learning to interpret facial expression with fifteen subjects and found improvement; but Boring and Titchener were alert enough to ask whether such learning was of stereotypes. G. S. Gates asked small children to identify vocal patterns, and Wells and Patterson have tested mood interpretation by presenting poetry, music, and pictures to experimental subjects. Blatz believed that the pulse curve would indicate temporal interval pattern responses; and recently a student has tried to observe the internal responses of movie actresses and actors to film love scenes by curves of the pulse (not referred to by Murphy).

Landis tried to discover patterned emotional responses by subjecting seventeen subjects to all sorts of "exciting, disgusting, and generally bewildering stimuli"—a sort of witches' brew situation; but Murphy had enough insight to see that comic opera entered in and that "response to the experimenter was not controlled"; and Landis doubted that the experiments showed specificity of responses by internal patterns. Schoonhoven set up an experiment to compare introspections and blood pressure to see whether there is a specificity of internal patterns and reported doubt, as in the case of Landis' experiments. Landis tried further to distinguish emotional responses if possible by showing lantern slides of men and women responding to stimuli not shown with the response and excluding posture, the facial expression only appearing. The guesses were bad.

Measuring the strength of hunger urges is another problem which has called forth a number of hypothetically relevant experiments. Dashiell tried to measure hunger drives by measuring the distance an animal in quest of food travels on a floor marked with squares. Moss and Morgan imagined that the strength of a hunger urge could be determined by how much shock was needed to stop it in the pursuit of a food goal. Warden put the hungry animal to crossing an electric grid.

Richter tried to learn more about the nature of animal instincts by comparing the body surface of animals with their consumption of water. Nissen, for the same purpose, studied the reactions of animals after gonadectomy. Yerkes and Bloomfield tested the innate nature of instinctive responses by observing the reactions of kittens at various ages to mice when the latter were experimentally presented. And Carmichael

tested the hypothesis of the motivation of instincts by the swimming of salamanders and tadpoles, while Avery carried on experiments with the embryos of guinea pigs to achieve the same purpose.

Finally, in testing the hypothesis of learning by conditioned response, Lashley cut away parts of animals' brains to learn whether they could perform an acquired response.

These examples could be continued beyond the brink of boredom of the way in which experimental set-ups are hypothetical opportunities for controlled observation; but after the experimenter has entered his laboratory he may or may not get out of it what the creative scientist with modest equipment brings forth out of his laboratory. Whether he does will depend upon his imaginal capacity to set up experiments which are really relevant to the problem in hand.

VI. OBSERVATION BY SAMPLING

Considerations of space require passing up, except for a single paragraph, the discussion of sampling as a procedure of observation the value of which depends upon keen insight into all the problems it involves. Robinson[41] has illustrated sound methods of sampling by reference to Agassiz's observation of glaciers, Sorokin's social mobility samples in Petrograd (1921-1922),[42] the important study made by R. H. Britten and L. R. Thompson, called *A Health Study of Ten Thousand Male Workers,*[43] and H. P. Shearman's work on index numbers in economics.[44] Britten and Thompson's study would not constitute adequate data to determine the health status of the entire population because it represents a sample from a select group and not a cross-section of the entire population. Health sampling, for example, to represent the whole population, must not be random or automatic, but differentiated by being chosen from different economic and social rankings in various geographical areas. Then it will represent the population as a whole only in so far as all age groups are proportionately represented, as well as insurance and non-insurance policy holders, sex groups, racial groups, and so on. Certainly, creative sampling would be required to estimate the prevalence of venereal

[41] D. S. Robinson, *Illustrations of the Methods of Reasoning* (New York, 1927), pp. 74-78.

[42] *Ibid.*, pp. 86-87.

[43] *Ibid.*, pp. 646-647.

[44] Henry P. Shearman, *Practical Economics* (New York, 1922), pp. 260-263.

diseases—something that has really never been done.[15] S. A. Stouffer[16] and M. C. Elmer[17] have made helpful suggestions on sampling.

VII. OBSERVATION BY SYMPATHETIC IMAGINATION

The third form of observation is sympathetic imagination, which, as already seen, Cooley described as a process of dramatization in which one person sympathetically "takes the role of the other" and imaginatively reacts what is thought and felt by the other.[48]

In response to Cooley, however, Markey contended that sympathetic imagination is nothing more than visceral observation, in which we observe with our responses, including those of our muscles, glands, viscera, and other apparatus.[49]

The fact remains, however, that visceral responses in one person cannot be observed by visceral responses in another independent of an above-all-other-response awareness involving sympathetic imagination. Furthermore, Markey's contention that we know others by the same process as we come to know trees needs either criticism or clarification. A man's responses to a tree do not constitute returns of the shuttle of social interaction, unless, perhaps, the tree has been a trysting place; then, whatever social meaning the tree may have is not in the tree; for it is not aware of the man and has no experience to be understood. Man never has to interpret the meaning he and other things have for it. There is no "conversation of attitudes."[50] Persons and objects do have meaning for others, whose responses are akin to our own. Some of these responses are overt, some are not. Experience and meaning, the source of overt responses, are never overt, however observable the stimuli. And if experience as such is responsive, it must not be confused with overt media of social interaction.

If the sense experience one has of inanimate objects is all one knows

[15] Spot maps are valuable, but they remain, in many instances, notorious examples of poor samples. The most unscientific spot map in our possession is one on venereal disease in Fort Worth. It is easy enough to get clinic cases, but almost impossible to get anyone else.

[16] "Sociology Sampling," in L. L. Bernard, *Fields and Methods of Sociology.*

[17] *Social Research* (New York, 1939), chap. xvi.

[48] C. H. Cooley, *Sociological Theory and Social Research,* p. 290.

[49] J. F. Markey, "Trends in Social Psychology," in Lundberg, Anderson, and Bain, *loc. cit.;* cf. Markey, *The Symbolic Process* (New York, 1928), chaps. ii-iii.

[50] G. H. Mead, "Social Consciousness and the Consciousness of Meaning," *Psychology Bulletin,* VII (1910), 310, cited in Fay B. Karpf, *American Social Psychology* (New York, 1932), p. 321.

about them, then all one can know of either physical or psychosocial facts is by the examination of our own sensations, states, and ideas, aided, of course, by all the measurements we can make. Even after measurement all knowledge would be subjective and come by introspection, a no less subjective process when described in objective terms. If one knows more of what the other feels when the other touches a red-hot iron than of the iron itself, it is by putting himself imaginatively in the other's place—not the way he knows the iron at all, and what he knows about the iron is not the same as what he knows about the sensation of the other.[51]

Waller claims that we proceed in the social sciences by (1) direct study of human and interhuman behavior; (2) "We may obtain insight by studying certain symbols, abstracted from reality, and supposed to stand in a constant relation to it; these symbols are usually numerical. (3) We may obtain insight through sympathetic penetration. This insight is based upon the fact that the behavior of others, either directly perceived or mediated to us through language or mathematical symbols, starts certain mental processes in ourselves. This kind of insight is peculiarly liable to error, but of all kinds of insight it is the most significant."[52]

In spite, too, of the danger of error, Waller writes to the effect that "nearly all of the things that people want to know about other people" are accessible only through sympathetic imagination; that, as Cooley held, it is likely that the growth of profound penetration into human life cannot wait on indisputable exactitude; that such penetration consists of "imagining what it would be like to be somebody else," of "an interpretation of the behavior of others in terms of purposes and emotional states imputed to them, not through introspection as a clue to the mental states of others."[53] Such sympathetic insight furnishes clues indispensable in the understanding of human nature.

George H. Mead,[54] Joshua C. Gregory,[55] Floyd N. House,[56] June E.

[51] A. L. Porterfield, *op. cit.*, p. 223.

[52] Willard Waller, "Insight in Scientific Method," *American Journal of Sociology*, XL (1934), 285-297.

[53] *Loc. cit.*

[54] George H. Mead, *Mind, Self, and Society* (Chicago, 1934), pp. 7-8.

[55] Joshua C. Gregory, "Do We Know Other Minds Mediately or Immediately?" *Mind*, XXIX (1920), 446-457.

[56] Floyd House, "Measurement in Sociology," *American Journal of Sociology*, XL (1934), 6.

Downey,[57] C. Delisle Burns,[58] W. Wylie Spencer,[59] S. Alexander,[60] Werner Sombart,[61] Max Weber,[62] and many other writers take similar positions, though differing from one another.

Toothaches, loves, angers, desires, resolves, [writes Gregory] seem to be as concealed from public inspection as the most abstract thoughts. They too can become known through speech and writing. Emotions like anger or fear usually lie more open to view because they more spontaneously express themselves in characteristic gesture or action. . . . This inferred knowledge that other minds are angry or happy or thinking about their knowledge of other minds, seems also to depend upon our own private experiences of anger or other mental conditions. We can know, to put it shortly, that others are angry because we have been angry ourselves and have expressed our anger in similar movements.[63]

William McDougall extends sympathetic imagination to the study of animal behavior and justifies doing so by the fact that "we know what it is to be concentrated on a task," building a house or hut or making a box or solving a problem, what it is to be interrupted and to return to the task until the goal is achieved. And if we depend only on objective observation and shut out our own experience in the interpretation of animal behavior, "we close the door to all understanding" of that behavior.[64]

Perhaps the most direct challenge to the concept of sympathetic imagination has been "the conditioned response explanation" clearly worked out by Humphrey in terms such as these: We burn or scald our hand; pain and withdrawing instantly follow. The sight of our hand in this or a similar situation inevitably serves thereafter to touch off the pain and withdrawing response. Any other hand which looks like our own will tend, if scalded or burned, to evoke, promptly enough, the same response in us. To feel horror as we watch the suffering of another is in no way more mysterious than to feel horror at our own sufferings.

[57] June E. Downey, *Creative Imagination*, pp. 166-167.

[58] C. Delisle Burns, *The Contact of Minds* (London, 1923), pp. 45-47.

[59] W. Wylie Spencer, *Our Knowledge of Other Minds* (New Haven, 1930), pp. 134-136.

[60] S. Alexander, *Space, Time, and Deity*, "Gifford Lectures, 1916-1918" (2 vols.; New York, 1920), Vol. I.

[61] Werner Sombart, discussed in Talcott Parsons, *Structure of Social Action* (New York, 1937), pp. 495-499.

[62] Max Weber, discussed in *ibid.*, pp. 591-601, 484-487.

[63] Joshua C. Gregory, *op. cit.*, pp. 446-457.

[64] Wm. McDougall, *Energies of Men*, pp. 51-52; cf. Franz Alexander, *The Medical Value of Psycho-Analysis* (New York, 1932), p. 35.

Exactly as the theory demands, the degree of our sympathy depends upon the degree of likeness which the individual shows to ourselves. If the person's skin is black or yellow, his hair kinky, his lips thick, his subjection to misery is of very much less significance to us. Some people feel no disturbance at all at pain inflicted upon animals, although practically everyone feels such response when other human beings are involved. We doubt whether the very general protest against the bobbing of horses' and dogs' tails could be intelligently explained in Humphrey's terms. The theory is, however, flexible enough to be stretched to cover such cases by recognizing a certain generality or diffuseness of stimulation and response, in which, for example, the bobbing of a dog's tail would be reacted to as if it were the cutting off of a finger.[65] (What about the horse's tail?)

"Even so, the theory fails to account for the raising or lowering of thresholds as the result of special bonds of sympathy or of special antagonisms."[66]

This theory of the conditioned response does not explain why people of one race often have more sympathy for people of another race than for many people of their own. Why should the larger section of the white world sympathize with Ethiopia rather than with Italy? Not even Gidding's consciousness of kind can be explained simply on the basis of a conditioned response as Willey and Willey have tried to do; and if Humphrey is right, the Willeys are wrong, since Humphrey makes race a factor in conditioning while the Willeys contend that the conditioned response explains why men of different race have a greater "consciousness of kind" at times than men of the same race.[67]

E. B. Holt enters another objection by his implication that human behavior has no more thought behind it than there is behind a flowing stream. To ask a man what he is doing will get you nowhere. He must be watched throughout the action. He illustrates this contention by saying that you may observe a man go to the depot, get on the train, go to another town, give a man in an office, marked *Real Estate*, some money, take in exchange a piece of paper signed by the other man, get some keys, get back on the train, go back to his home town, go to an

[65] G. Humphrey, "The Conditioned Reflex and the Elementary Social Reaction," cited in Gardner Murphy, *Experimental Social Psychology*, pp. 181-182.

[66] Gardner Murphy, *loc. cit.*

[67] Malcolm M. Willey and Nancy Boyd Willey, "The Conditioned Response and Consciousness of Kind," *American Journal of Sociology*, XXX (1924), 22-28.

empty house, go in, receive vans at the door, direct the placing of furniture, and begin at stated intervals to come and go from that house. Holt affirms that one could get nowhere by asking him at the station, as he bought his ticket, *what he had on his mind*.[68]

When Holt can imagine nothing of what the man is doing beyond what he sees in the man's behavior per se, can imagine nothing of the man's behavior in terms of his own, he is not thinking the thing through. Not even the bee's behavior means anything to him except in terms of his own. It is like his or different from his. He can *observe* the overt behavior of a fish just as clearly as he can the the same kind of behavior in man, but he will never know how it feels to have gills instead of lungs. The man who says he feels like a fish simply does not know what he is talking about. When he *feels* like a fish, with respect to gills, he will have gills. When he *says* he feels like a fish, he feels much that a fish probably never feels—chagrin over being hooked with a bait, inferior, and self-reproaching.

The proposition that a man must have gills to know how an animal with gills feels ought to please J. F. Markey, who, as we have seen, holds that we observe with our viscera and muscles. But the difference between a man with gills and a fish with gills is that, in addition to visceral awareness, a man has an above-all-other-response awareness of that awareness, a self-consciousness and a social-consciousness; a consciousness of the other one, which helps him to refer imaginatively *this pain in your heart* or *this sorrow of yours* to a *possible pain in my heart* or a *possible sorrow of mine* in a similar circumstance, whether I have a pain in my heart or not—possibly only in my toe, or have been involved in a similar circumstance calling for sorrow.

C. A. Ellwood has gone further than any other man in catching the significance of this kinship inferred from a different kind of circumstance when he writes:

> The method of "sympathetic introspection" by which we *try to understand the behavior of someone unlike ourselves,* such as a child, a criminal, or the member of another race or sex, is again the use of imagination to put ourselves in the place of such individuals, checked up by the facts of our experiences with the class of individuals described.[69]

[68] E. B. Holt, *op. cit.*, pp. 84-85.

[69] C. A. Ellwood, *Methods in Sociology*, p. 74. Italics are mine.

A source of insight, which, as we have seen, is similar to sympathetic imagination, is naturalistic *empathy*. By way of review, we observe that R. S. Woodworth defines *empathy* as the process of "feeling oneself into the object contemplated"—a flying kite, a hawk, a balloon, an aeroplane, a rocket, or a sunset on "Twelve Mile Prairie." He holds that such things fascinate us because of the "feeling into" or impressionistic identification of oneself with these scenes. As sympathy means "feeling with," empathy means "feeling into," or projecting the self into the object observed and getting some of the satisfaction from watching it that one would get from being that object.[70] And Downey holds that we understand persons by a process akin to empathy in which we assume the other personality and become aware of "how it feels to behave thus and so, and we read back into the other person our consciousness of what his pattern of behavior feels like. Much further reaching than sympathy is empathy [Ellwood reverses this opinion]. We may sympathize at times when we cannot empathize because of inadequacy of experience."[71]

A pure case of lack of what Downey calls "empathetic imagination" appeared as a news item last Christmas, relating how a man sixty-one years old was brought to court for hitting his wife because she wanted to listen to dance music on the radio, while he wanted to hear such Christmas carols as "Peace on Earth!"

Empathy in the artist is his capacity for appreciation of the attitude and values of others and his ability to put them on canvas or in sculpture as a result of his spatial-social imagination. It is, as pointed out in Chapter IV, this capacity for appreciation of the attitudes and values of others that looms large in the qualities of either an artist or social scientist and, as yet to be emphasized, constitutes their kinship.

As A. W. Beaven once warned in an address, we must not assume that intellect is the one means by which man may come into contact with reality.[72] There are great areas of the real world that may be made available to the personality only through the development of appreciation. That girl who powdered her nose on the brink of Grand Canyon soon after her arrival there, seeing only herself in the mirror, then yawned and asked, "When does the bus go?" while others stood in profound reverence,

[70] R. S. Woodworth, *Psychology* (New York, 1921), p. 491.

[71] *Op. cit.*, p. 74.

[72] Cf. R. E. Park, "Reflections on Communications and Culture," *American Journal of Sociology*, XLIV (1938), 187-191.

could never be either an artist or a sociologist. But Keats was possessed of the necessary empathetic insight when he wrote these words in "On First Looking into Chapman's Homer":

> Then felt I, as some watcher of the skies,
> When a new planet swims into his ken;
> Or like stout Cortez, when with eagle eyes,
> He gazed upon the Pacific and his men
> Looked at each other with a mild surmise,
> Silent upon a peak in Darien.[73]

Such men as Lewis Carroll and Hans Christian Andersen possessed qualities that every social scientist should have—an ability to get into the minds of others—to understand a little child as few professional psychologists, rat, graph, and all combined ever do. Who has more psychological insight than Lewis Carroll in *Alice in Wonderland?*—a question often asked. As to Hans Christian Andersen, Georg Brandes declares:

> His stories are numbered among the books which we have deciphered syllable by syllable, and which we still read to-day. . . . And what a delight it must have been for Andersen to see in his dreams this swarm of children's faces by the thousands about his lamp . . . Danish boys . . . English babies . . . Hindu maidens . . . [children] in all lands . . . tongues, healthy . . . merry . . . sickly . . . pale . . . rich . . . poor . . . eagerly stretch forth this confusion of white and swarthy little hands after each new leaf that is ready. . . . When he busies his fancy with childish dreams . . . there come to him his . . . inspirations. . . .[74]

In other fine arts, insight comes in similar manner. Lorado Taft is quoted by Krueger and Reckless on the way in which he received his inspiration for "Black Hawk," a forty-eight foot figure of an Indian, which stands on a high bluff above the Rock River, near Oregon, Illinois. "It expresses the soul of a dying race, its fine spirit of bravery, patience, endurance, its poetry, aspiration, and sorrow." Taft relates:

> This is the way it happened. Every evening as the shadows turned blue we walked over this bluff. We always stopped at this point to rest—this (in 1911) is our fourteenth summer and we have generally taken this contemplative attitude, restful, reverent. As we stood here, we involuntarily folded our arms, and it came over us that generations before had done so. So the

[73] Quoted in George H. Green, *The Terror Dream* (New York, 1929), p. 69, with reference to the above idea.

[74] Georg Brandes, *Creative Spirits of the Nineteenth Century*, trans. R. B. Anderson (New York, 1923), pp. 4-5.

figures grew out of the attitude, as we stood and looked upon these beautiful scenes. . . . I did not study any one type or race of Indian. It is a composite of the Foxes and Sacs, the Sioux and the Mohawks; in short, it represents the Indian personality. I have left off the usual Indian trappings—the feather and the buckskin and other conventional signs. Some even find a hint of the old Roman in the face, which was necessary to make it suggest a spirit unconquered while still the conquered race.[75]

A final example of the kinship of social scientist and artist is found in a quotation from Willit S. Hardin:

It was Shakespeare who "having seen a leaf and a drop of water . . . could construct the forests, the rivers, and the seas. He could see the cataracts fall and foam, the mists rise and the clouds form and float. . . . Looking at a coat of mail, he instantly imagined the society, the conditions that produced it, and what it produced. He walked the ways of mighty Rome and saw great Caesar with his legions in the field. . . . He heard the shout that shook the Coliseum's roofless walls when from the reeling gladiator's hand the short sword fell, while from his bosom gushed the wasted stream of life. . . . He knew all crimes and all regrets, all virtues and their rich rewards. He was victim and victor, pursuer and pursued, outcast and king; heard the applause and curses of the world, and on his heart fell all the nights and noons of failure and success. . . . He has knelt with awe and dread at every shrine, offered every sacrifice and every prayer, has seen all devils, mocked and worshipped all the gods, enjoyed all heavens, and felt the pangs of every hell."[76]

VIII. IMAGINATION IN CLASSIFICATION

In turning from observation to classification in research procedure, we recall the couplet:

> The world is so full of a number of things,
> I'm sure we should all be as happy as kings.

These lines express a privilege without implying a danger to the human psyche that only the dynamic nature of mind can turn into a privilege or escape as utter distraction. The scientist *as scientist* concerns himself with fewer of these things than in everyday life, because he must work within a definite frame of reference; but when he begins to try to classify the data he observes in a world, "so full of a number of things" in his own limited field, he needs an active imagination. For to think of classification as a simple laying of like things side by side will not even do for "sticks

[75] Quoted in Krueger and Reckless, *Social Psychology*, p. 221.

[76] Willit S. Hardin, "Science, Religion, and Art," *Science, Religion, and Philosophy*, I (1931), 71.

and stones and dead men's bones"; and the reason why this laying of like to like is not so easy, as we have already seen in the Aristotelian-Galilean discussions of the regular, the frequent, and the individual occurrence, rests in the nature of nature itself.

Classification depends largely upon the basic philosophy constituting the ground out of which classes arise as figures. This fact may well be illustrated by the performance of two pre-Darwinian zoologists, namely Cuvier and Karl Ernst von Baer, whose names enter here because their viewpoints in zoology were analogous to two fundamental viewpoints of society—that is, society as process and society as a patterned structure or cross-section. Von Baer and Cuvier both made four grand divisions of the animal world. The vivid imagination of Cuvier is shown by the names of his concepts in his classification. For him animals were built on four plans: (1) radiates, (2) mollusks, (3) articulates, (4) vertebrates—a vivid description of patterned structures; yet these concepts do not indicate anything whatsoever of a genetic nature—of distinct manners of becoming. Von Baer, with a background of study in genetics, took process into account and created names implying manners of development in each type of animals. He therefore called his types: (1) peripheric, (2) massive, (3) longitudinal, and (4) doubly symmetrical. Though L. Agassiz favored Cuvier's concept of articulates rather than von Baer's concept of a longitudinal type, he said of the concepts, vertebrates and doubly symmetrical: ". . . the latter is the better of the two, since Cuvier's name of vertebrates alludes only to the backbone, while Baer, who is an embryologist, signifies in his their mode of growth also."[77]

That brings to a head exactly the difference between those who hold the physical science viewpoint and the genetic-cultural viewpoint in social science. The units of study, concepts, and constructs set up, developed, and made use of emerge as figures out of a mental ground which determines them. The concepts of one ground are blurred in meaning when placed against another ground—that is, they have no fieldness in the opposite ground. The institutional social psychologists like Allport and Kantor have a set of concepts that make sense—to Allport[78] and Kantor[79]

[77] L. Agassiz, *op. cit.*, chap. ii.

[78] Floyd Allport, *Institutional Behavior* (Chapel Hill, 1933); "The Group Fallacy in Relation to Social Science," *Journal of Abnormal and Social Psychology*, XIX (1924), 61 ff.

[79] J. R. Kantor, "An Essay Toward an Institutional Approach to Social Psychology," *American Journal of Sociology*, XXVII (1922), 758-779.

—to the institutional psychologists. To a cultural determinist like Willey they do not make sense;[80] and the cultural determinist, almost as much as the physical science methodologist in sociology, is limited in the genetic viewpoint as Agassiz thought Cuvier was in his zoological "plans."[81] In culture he sees *radiates* and *vertebrates,* let us say, but does not take full account of process. Sociology needs a set of concepts, and is developing them, embodying both the longitudinal and the cross-sectional view.

Physical science is much more successful than social science with a cross-section view of reality and with laying like to like in classifying data in groups whose individuals possess great uniformity; or at least enough uniformity in significant particulars to make the procedure highly successful compared with like attempts in social science. Perhaps, as Znaniecki says, in making classifications in any field of data, there must be a gradation of importance of common characteristics held by individuals, rather than simply a counting of the greatest number of characteristics held in common among the individuals to determine whether we shall place them in the same class. In the expression of his views, he comes nearest to a position compatible with both the Aristotelian and Galilean theories. He writes:

> For instance the possession of vertebrae is a character which determines the nature of the horse in a larger measure than the formation of his feet, the latter in a larger measure than the shape of his tail; and at the same time, the first character is shared by the species horse with all the species of mammals, birds, reptiles, fish; the second only with a relatively small variety of hoof bearing animals; while the third is an exclusive character of the species. Such a gradation of importance and generality enables the scientist in his theory to approach, if not fully to achieve, the ideal which combines a maximum of empirical detail with a maximum of logical systematization.[82]

There are only two other ways to approach the problem of classification in general: (1) to hold that artificial classification is the only possible procedure, or at least wholly sufficient for scientific purposes; (2) to hold that comparable and measurable units of study can be found in all sciences and proceed to lay down rules for classification as if all science were one. Then we get the following results:

In the first place, we get an unimaginative cataloguing of facts which may ignore either essential similarities or differences, full of the fallacy of

[80] M. M. Willey, "The Validity of the Culture Concept," *American Journal of Sociology,* XXXV (1929), 204-219.

[81] *Op. cit.,* chap. ii.

[82] Florian Znaniecki, *The Methods of Sociology* (New York, 1934), p. 258.

concealed classification. For example, Carl Murchison can see no difference, when he nods, between classification for convenience and natural classification, and he even goes so far as to deny the existence of the latter. For him, there is no difference between the nature of groups of post-office pigeonholes on the one hand and of human social groups on the other. Writing of "The Illusory Nature of Group Existence," he says:

> It is but a step from such admittedly non-social groups to traditional social groups such as the family, the crowd, the labor union, or the state. The reason there is only one step is because there are no important distinctions. Both non-social and social groups are merely convenient symbols for the guidance of the man who is using the words.[83]

To take such a position is to ignore the nature of things altogether and to count them as so many things that look alike, regardless of functions and co-implications. Whatever else it may be, such view is not scientific.[84]

In the second attitude we assume that all units of reality are subject to arrangement by statistical series and measurement or correlation. This attitude appears in Lundberg's work. He asserts:

> The fundamental reason for classification is that science is invariably concerned with uniformities in large numbers of phenomena, and the process of determining these uniformities consists of separating the whole mass of phenomena into categories on the basis of their likenesses and differences. Certain characteristics of an object are selected as significant for certain purposes. Objects possessing these characteristics are classified together, objects which do not possess the significant characteristics are excluded from the class. These likenesses and differences may be quantitative or qualitative—in terms of "place, time, circumstance, quality, magnitude, activity, behavior or function, coexistence of sequence." The number of classifications which can be made out of almost any body of phenomena on these bases are exceedingly numerous. What characteristics we shall use as the basis of classification is always to be determined by the end sought.[85]

Plainly the only scientific method, according to this view, is statistical and concerned with *uniformities in large numbers*. Yet, by Lundberg's own admission, classification itself is a mental process, and has no more value than creative mind determines by the end sought. *The mind always figures; the figures never mind.* But the mind must do more than figure.

[83] Carl Murchison, *op. cit.*, chap. xx.

[84] Cf. Kurt Lewin, *A Dynamic Theory of Personality*, p. 3.

[85] George A. Lundberg, *op. cit.*, p. 72; cf. F. H. Giddings, "Societal Variable," *Journal of Social Forces*, I (1923), 346.

If it cannot imagine great fields of social phenomena with data that must be classified according to *field* theory rather than according to *class* theory; if it cannot find lawfulness in unique configurations and total situations as well as in uniformities in great numbers, it can really, with all its statistics, discover little about society that we need to know. Let us indicate lawful social wholes that cannot be classified in large numbers. John Dollard writes about average and private views of social situations:

> There is an objective view or a sort of average of what others would recognize in it; and there is also an extremely private or personal view of the situation to which the subject actually reacts. We mean here the first or "average" view of it when we say the "situation." If we mean to indicate the private version, we shall in every case say so.
>
> We will take the case of a six-year-old boy who is asked to go frog spearing by other boys. The average (or cultural) definition of this situation would be something like this: the boy is free and able to go; frog spearing is a culturally permitted activity in his community and is even specifically encouraged by his parents since they would welcome the edible frog legs; he has a spear; he has the example and encouragement of the other boys; there are frogs accessible; he has the necessary arm-eye coordinations to throw a spear; as a normal boy he ought to respond positively to the excitement of this proposed hunt. We could go on specifying these elements in the "average" view of the situation but it is hoped that the point is clear.
>
> However, he cannot hunt; he goes along with the other boys; takes his spear, intends to hunt but when he actually sees a frog his arm is somehow "held" and he cannot throw the spear. He feels humiliated that he does not bring anything home from his hunting and the other boys josh him about being a sissy. Even this pressure does not enable him to conform to the behavior expectation in the situation. Our only remaining assumption is that some "private" definition of the situation tends to interfere with the official one. A life history of the boy confirms this view. Briefly put, he cannot spear frogs because they are equated in his phantasy with persons and eventually with himself. Under these circumstances we would not expect him to be a good spearman. Theoretically put, he has a private version of the situation which differs from that of the other boys and from that of the community at large. It is this private version that disturbs his behavior.[86]

We have here, then, two objections which we shall note repeatedly, at least by implication, to the theory that only statistical correlations of classified series constitute scientific method in dealing with social reality: (1) that classification on such a basis does not take account of process, and (2) that science must not only concern itself with uniformities but with

[86] John Dollard, *Criteria for the Life History* (New Haven, 1935), pp. 30-31.

applying its laws to the individuals to whom they are supposed to apply. A law that cannot be so applied is not a law. As R. G. Collingwood has pointed out, a scientist must also move from universals to particulars. He must not only know igneous rocks, but he must also know an igneous rock.[87] This application of knowledge of universals to particulars cannot be automatic. And Goldenweiser agrees that

> The physician would be even worse off than he is, if not for the occasional emergence of common sense which breaks through dogmas with intuitive freshness, or those flashes of insight for which talented diagnosticians are noted, or finally, an opportunity to make a biographical study of a patient, a luxury few physicians can enjoy and few patients can afford.
>
> With the subject of the uniqueness of particulars, is ushered in intuitive mind as it functions in religion, art, and other forms of imaginative creativeness.[88]

This view is not Pearsonian even for social science. It simply makes room for lawful configurations that have arisen, however many contingencies may have entered into the life of individuals in the life-history process. Goldenweiser shows that statistics dealing with universals must be largely supplemented by case studies dealing with particulars. For each case is itself a whole within which many forces operate in dynamic interaction. The delinquent, the insane, the beggar, the invalid, and the sleepless statesman cannot be understood by being counted and classified. Only insight with personal history will tell why a person is in this or that class and what may be potent in getting him out of an undesired classification.

Karl Pearson, who by constant repetition has made popular the notion that science is but classified facts, adds in a footnote that "classification is not identical with collection. It denotes the systematic association of kindred facts, the collection, not of all, but of relevant and of crucial facts." But what facts are kindred, relevant, and crucial is precisely the question that empiricists blandly ignore. For in their dogmatic haste to explain the origin of knowledge from sensation, they will not stop to admit the obvious fact that the successful progress of any scientific investigation depends largely upon the initial or anticipatory ideas according to which it is instituted and according to which it proceeds.[89]

[87] R. G. Collingwood, in *Mind*, XXXI (1922), 443 ff.

[88] A. Goldenweiser, *Robots or Gods*, p. 62; cf. R. E. Park, "The Sociological Methods of William Graham Sumner," *et al.*, *Analysis 8*, in Stuart Rice, *op. cit.*

[89] Morris Cohen, *Reason and Nature*, p. 80.

Thus, classifications, always, if significant, hypothetically involve structures, relations, sequences, events, and/or causation. But they do not call attention to themselves in any science. The positions of the moon and the movements of the tides do not speak aloud their relations. Classifications of falling bodies and classifications of falling conditions were the work of Galileo, who did nothing a schoolboy could not have done "if he had thought of it."[90] The elements in chemistry lined themselves up in the mind of a dreamy philosopher, who, of course, was no stranger to his laboratory. Mendeleef "arranged all the elements in the order of increasing atomic weights. . . . He saw no particular value in arranging the elements in this way. Unknown to Mendeleef . . . it had been done previously by John Newlands who had noticed that each succeeding eighth element showed properties similar to the first element." This led Newlands to compare the table of the elements to the keyboard of a piano and to speak of chemical *octaves*. The society to which he read his paper laughed at him and sent him home in disgrace. Mendeleef, instead, let each of sixty-three cards represent an element and its properties. Reassorting his cards and putting similar elements together, he found that "the properties of the elements were periodic functions of their atomic weights." Study of chemical literature indicated that he had misplaced iodine with an atomic weight recorded as 127, and tellurium 128 to agree with his scheme of things. Believing in his table, he declared that the literature was wrong. He also questioned other atomic weights only to be met by the weighers with scorn; "and again the balance of the chemist came to the aid of the philosopher," and Mendeleef was vindicated.[91]

IX. IMAGINATION IN QUANTIFICATION

If imagination has, thus, played so great a part in classification, let us turn for a moment to its part in quantification.

Broadly speaking, quantification may be equated in the social sciences with statistics; and statistics, as the writer understands the term, does not mean *measurement* but *enumeration* and *comparison*. The data are classified, enumerated, ordered in series, and correlated, series with series. The degree of correlation may be high or low, but however high it may be, as the writer understands its interpretation, it indicates a relation between the compared series only when the relation proves logically con-

[90] A. D. Ritchie, *Scientific Method* (London, 1923), p. 69.
[91] B. Jaffe, *Crucibles*, pp. 207-211.

sistent; otherwise, *otherwise*. According to Karl Pearson, however, when *A* and *B*, as bodies of data, are classified, ordered into series, and compared, correlation shows us how one series behaves as a mathematical function of the other, each series being only an ordering of our sense impressions. Thus, when two series of sense impressions appear together as highly correlated, such correlation is causation; that is, tells us all about causation that we can ever know. If, therefore, Karl Pearson holds that "science is measurement," he can only mean the measurement of sensation as ordered in the "routine of perception"; for he holds that "of the world outside sensation science can only logically infer chaos, or the absence of the conditions of knowledge; no human concept, such as order, reason, or consciousness, can be logically projected into it."[92]

If natural law is only a routine of perceptions and if all science is only the measurement of such routines, is there knowledge that is not scientific; not subject to coefficients of correlation? To what extent can statistical procedures be applied to social reality as direct measurements? Are there any routines of perception that are known better as "routines" without the use of statistics than with their use? In short, what are the uses and the limitations of statistics in social science?

Frank Alexander Ross has outlined three schools of attitudes toward the use of statistical data and techniques in sociology. First, there is the school that says, "We are through with philosophy and its procedures in social science. The future of social science 'rests almost exclusively on quantitative statements . . . and on procedures for handling these numerical data.'" Second, there is another school that holds that the essential elements of social science cannot be studied in quantitative form; that statistics cannot get at the kernel. Third, those who take the middle of the road hold that statistics is but one technique for handling observations and that theory and observation go hand in hand.[93]

When we begin actually to inquire what we can do with statistics in social science, we find Vivien M. Palmer holding that they serve four purposes: "(1) to discover the extent of selected attributes by counting their occurrences; (2) to discover trends by comparing enumerations which are made at intervals; (3) to compare the distribution of selected

[92] Karl Pearson, *The Grammar of Science*, pp. 128-131, 150; cf. Ellwood, *Methods in Sociology*, pp. 100-101.

[93] F. A. Ross, in *The Fields and Methods of Sociology*, chap. xv.

types of cases by localities; and (4) to measure the frequency with which given attributes are found to occur in constellation in a given case."[94]

By counting attributes commonly recognized as accompanying a certain type of phenomenon, Miss Palmer means those which are popularly supposed to be "causes" of such a phenomenon as juvenile delinquency: nationality, broken homes, child labor, race, locality, sex, and the like.

The counting of such attributes may prove to be of great value in the explosion of many popular ideas as to the "cause" of a social or a personal condition, and it may suggest new leads or indicate new relations to explore, but it may lend itself, and often does so, to the rankest particularism, if the counting is done by the particularist. A great deal of imagination is needed to keep the counter of such attributes asking, "What else? What factors have I possibly overlooked? What is the significance of the presence of the attributes I have observed as present? Are they proportionately present in the population at large?"

Miss Palmer says that exhaustive case studies must be made of individuals in which these characteristics, dealt with statistically, appear. This need for case studies suggests a shortcoming of the second use proposed for statistics; that is, when we attempt to discover trends by comparing enumerations which are made at intervals, we are often able to fill in the intervening stretches by inference—as simply and amply demonstrated by *Recent Social Trends*[95]—but we do not get at the full historical process without an imaginative appeal to history.

Suppose we appeal to statistics alone for an understanding of immigration trends, trends in assimilation, community groupings, the maintenance of national traits, religious sentiments, and so on. Suppose we cut through immigration streams of Scotch-Irish, German Palatinates, and Moravians, Chinese, and Japanese at different periods of the nation's history to obtain statistical cross-sections by means of which we try to infer the total processes and understand present trends in attitudes. The result will be failure. Count the Moravians and test their attitudes by twenty-five year periods, using standardized attitude tests, and you will still not be able to understand the Moravian settlement at Winston-Salem, North Carolina. What is needed is a case history of the community extending back into Old World relations; and this very need for understanding process has led Chicago University sociologists to develop extensive use

[94] Vivien M. Palmer, *Field Studies in Sociology*, pp. 26-29.

[95] *Recent Social Trends in the United States* (2 vols.; New York, 1933).

of the "natural history" technique. It has led C. A. Ellwood and many others consistently to point out the necessity for appealing to history for data in sociology. However, there is no one who will deny the usefulness of cross-grain views; but such views certainly need to be supplemented by a many-sided history of the given regions and populations being studied.

The third use of statistics outlined, which is to receive some consideration later, was the locality-natural area-spot-map technique. The fourth use suggested was correlation to determine the frequency of attributes constellated in the same case. This use probably comes as near as any to lending itself to an understanding of the total situation. Tylor proposed correlating culture traits in given areas to determine clusters, and anthropologists are finding the method valuable in the study of the migration of traits to see whether clustered traits break up in the process of transmission.[96]

In speaking of the services of statistics, Hornell Hart assures us that, while statistical techniques vastly reduce the probability of many of the serious logical fallacies, they "do not eliminate the necessity for common sense scientific insight or laborious research." Statistics are not "an automatic method of ascertaining truth," and are "far from a fool-proof mechanism," which "has dangers of its own."[97] And Willard Waller reminds us that "statistical method is a successful method of discovering truth when it is used to subserve insight, and that it fails when it is used without insight." To him, the valid use of statistics appears to be "to treat mass phenomena . . . to give objectivity to social investigations . . . to sum up and check partial insights, and . . . to determine the relative numerical importance of known causal configurations."[98]

Finally, statistics may serve to dramatize a situation so that it can be taken in at a glance. This dramatization is inescapable in Chapter XII of *Recent Social Trends* on the "Vitality of the American People."[99] For instance, Figures 4a, 4b, and 5 show the trends in mortality among persons of different sex-age groups in the United States and Massachusetts during a period of years. Regardless of sex or age, the period of the

[96] Clark Wissler, "Anthropology," in Wilson Gee, *op. cit.*, p. 100; cf. A. Goldenweiser, "Anthropology and Psychology," in Wilson Gee, *op. cit.*, p. 82.

[97] Hornell Hart, "Science and Sociology," *American Journal of Sociology*, XXVII (1922), 382.

[98] Willard Waller, "Insight in Scientific Method," *American Journal of Sociology*, XL (1934), 291.

[99] Edgar Sydenstricker, in *Recent Social Trends*, Vol. I, chap. xii.

World War produces a sharp mountain peak in the curve of white and black races alike. The curves present graphically the facts: (1) that the mortality of children under five years of age did not decrease materially until about 1900; (2) that the rates at which persons over five years of age but under middle age have died have been steadily downward; (3) that the rates at which persons of the upper adult groups have died has been steadily upward; (4) that significant sex-differences appear in the rate at which mortality has been decreasing, particularly during the last decade.

What the curve does is to dramatize the fact that certain forces are operating to change its direction. What these forces are, the curve itself will never answer. Neither will a curve predict its future trend, because it simply asks the question, Is there a definite trend in the present or has there been one in the past? and it answers only that. And when there is a definite fluctuation, the curve starts the scientific mind to asking questions which may lead to hitherto overlooked factors in the production of a situation.

As Pearson believed, statistics form an effective technique in dealing with mass "routines of perception"; but we may well ask whether there is not much social knowledge, even "routines of perception," which may be known better without the use of statistics than by the use of statistics alone? The answer to this question is found in Charles Booth's *Life and Labor of the People of London,*[100] although Booth declared he was depending upon statistics only. Park quotes him with reference to his "resolution to make use of no fact that I cannot give a quantitative value," although "the material for sensational stories lies plentifully in every book of our notes; but even if I had the skill to use my material in this way—that gift of the imagination which is called 'realistic'—I should not wish to use it here." No one, Booth says, can doubt the existence of struggling poverty, destitution, hunger, drunkenness, brutality, and crime, as he goes from house to house, yet, his concern was not to describe these social facts, but to "attempt to show the numerical relation which poverty, misery, and depravity bear to regular earnings and comparative comfort and to describe the general conditions" in the light of these numerical relations.[101] Then Park affirms:

[100] 9 vols.; London, 1892, I, 97.

[101] R. E. Park, in T. V. Smith and Leonard White (eds.), *Chicago: An Experiment . . .* (1929), p. 5.

It was not, however, Booth's statistics but his realistic descriptions of the actual life of the occupational classes—the conditions under which they lived and labored, their passions, pastimes, domestic tragedies, and life philosophies with which each class met the crises peculiar to it—which made these studies a memorable contribution to our knowledge of human nature and society.[102]

Such methodological constriction of the acceptable sources of social knowledge as Booth sought, theoretically, to follow would, as Park shows, be most unfortunate. What social knowledge, for example, can be gleaned from the newspapers? A Will Rogers saying, "All I know is what I see in the papers," may get closer to a sympathetic understanding of human nature with little knowledge of its biological foundations or of methods of its study than many technical experts ever get. Of course, Rogers trespassed often when he did not know that he was trespassing on fields to which his knowledge did not extend; but, as all students know when alert, any moment may be freighted with a significance that will be lost to the man who has his thoughts fastened only on data that are amenable to certain techniques of measurement rather than on data some of which may never be subject to quantification at all.

We may recall the effect produced upon the American population by an Orson Welles broadcast dramatizing an alleged invasion from Mars. Should the sociologist not realize that the reactions to this broadcast, manifesting excitability, gullibility, and superstition, were not given in the artificial atmosphere of a laboratory but in a real life situation? The social scientist had better rise at five o'clock in the morning to hear Hitler speak in April over the radio as he addresses the Reichstag if he hopes to catch the attitudes of German leaders in the subtle implications of the responses of the members of that body—catch these subtle implications in April if he wants to understand September. Such a social situation is eloquent even to the listener who does not understand one word of German.

On the Christmas before the death of King George V, the radio is turned to the Christmas program of the British Empire being broadcast from the city of London. In a few minutes, the British monarch will speak, and his voice will be heard in a small, dingy, three-room apartment in Durham, North Carolina. Before the King speaks, however, greetings will come from ten different points of the Empire:

[102] *Loc. cit.;* cf. Graham Wallas, *The Art of Thought* (New York, 1926), pp. 108, 132.

(1) A woman in Northern England tells the whole world that she has just finished her Christmas dinner. (2) A family in Ottawa, Canada, speaks into the microphone, beginning with the father and ending with the two-year old son. (3) A farmer in Northern Scotland sends greetings from his snow-covered farm to a friend in South Africa, whose family are dressed in light summer clothing. (4) The South African farmer, in an open-air broadcast, responds with his family to his friend in Scotland. (5) A fisherman speaks from a fishing boat in Dundee Harbor on the coast of Ireland—and the whole world hears the engines hum. (6) An Arctic expedition to East Greenland sings the world a Christmas song. (7) An English official greets the world from Bombay. (8) A Christmas party for the children of families on unemployment relief in Wales sings songs and rejoices in toys—one little boy with his erector set would build a battleship!—a fact which proves that spatial distance gives away much more readily than social distance, though evidenced in the heart of a little child. (9) A taxi driver in London and his children greet father and grandfather in New Zealand. (10) Then came the voice of a man in Australia, living in New South Wales. And after that, we heard the voice of King George.

Six tragic years have passed since this program dramatized the annihilation of physical space in presenting a cross-section of the Empire now embattled by many enemy thrusts and bombs; but that hour suggested a political stability which the Empire, at this writing, still preserves while the rest of Europe has gone down. And what meaning was packed into these few minutes—for those who know how the Empire grew—to symbolize a world of contrasts and kinships, conflicts and alliances, exploitation and other-regarding, despair and hope, and obstacles to and hopes for progress! Statistics are essential; but the content of this hour was full of insights that statistics cannot give; insights that would be lost on the expert who carries nothing but a quantification net, since such a net is not wholly sufficient even for butterflies and beetles.

Although some of his later works show that Sorokin may be himself making less critical use of statistics than formerly, he realizes the limitations of a "fact-finder" who wants to be "objective," "quantitative," and "experimental." Such a behavioristic fact-finder "can take for his study only such problems as can be studied along these lines: that is, only those that can be put under experimental conditions," and can be "observed

'objectively,' on a small scale, in a limited span of time and space." He continues:

> Meanwhile, as a rule, only the best known and most routine type of phenomena has reliable quantitative data; only the simplest, and therefore the best known socio-cultural phenomena can be studied under experimental or pseudo-experimental conditions; only the simplest and best known phenomena again can be studied "overtly" or "objectively." The more complex phenomena, often the more important and significant, especially if they are taken on a large scale in time and space, with a broad perspective, and in all their real intricacy, do not have the necessary statistics; they cannot be studied in a laboratory under experimental or pseudo-experimental conditions, nor can they be reduced to mere "overtness." Even the very grasp of these phenomena demands a large background, developed analytic thinking, and many other qualities. *Hence the nemesis of the "fact-finders:" they find usually only such facts as are already well known; their study of these is often but a "painful elaboration of the obvious."* They rarely find *new relevant* facts.[103]

Sorokin thinks that such an attitude causes the fact-finder to narrow the range of data studied until he comes to be concerned "more and more with less and less"; that such narrowing of mental vistas will lead to "an increasing dullness of scientific thought," inhibiting "more and more the spirit of pioneering, a real originality, and the creative play of thought."

Read Bain sharply disagrees with what has been said, and claims that all scientific knowledge is quantitative. He holds that "the only certainties transcending common sense in sociology or in any other science are statistical in nature"; and that if sociology cannot become statistical it will remain forever a "bastard discipline sired and damned by common sense and normative knowledge."[104]

In a slightly earlier issue of the same journal in which Bain's article appeared, W. F. Ogburn, as much given to the use of statistics as any other American sociologist, is not so dogmatic as the younger sociologist, Bain, as he speaks of the "greatest limitation of statistics" as the one that "needs to be stressed least, because it is obvious"; that is, the fact that "so much knowledge is either unique or the quantitative aspects are not sufficiently great to be called statistical." Such is the case, says Ogburn,

[103] P. A. Sorokin, "Some of the Basic Factors in the Improvement of Scholarship among American Students of the Social Sciences," an unpublished paper lent me through Professor Ellwood. Cf. Florian Znaniecki, *The Methods of Sociology*, who goes even further than Sorokin to suggest that statistics stultify creative activity where greatly emphasized.

[104] Read Bain, "Measurement in Sociology," *American Journal of Sociology*, XL (1935), 486.

largely, in history, political science, ethnology, law, ethics, religion, and journalism, "although there are some statistical measurements in each of these disciplines."[105] In the same place, Ogburn stresses "the general work preparatory to the task of reaching definite conclusions," "the delineation of concepts," and the work of classification as being within "another great area of non-statistical scientific work."

While Bernard was able to show by a compilation of instincts how a perfect chaos results when different lists are placed side by side, one wonders what annihilation might take place if a similar method were used on the results achieved in any field of social studies through the use of whatever methods and techniques. Let us use the technique of statistics as an example and imagine what it would be like to compile a list of the things that have been proved and disproved by statistics.

Statistics have shown, among many things, that prohibition was successful and that it was not successful; that alcohol is good for man and that it is bad for man; that the manufacture of alcoholic drink would supply employment and that it would cause unemployment; that there are more arrests during wet rule and that there are not; that insanity is increasing, when it may not be; that Negroes are and are not inferior to whites; that immigrants are and are not less intelligent than the native-born American; that savages have and have not keener senses than civilized man; that the children of the foreign born are and are not more criminal than the children of the native-born American; that inferior families do and do not have more children than those of superior intelligence; that dolichocephals are and are not more intelligent than brachycephals; that Negroes' brains are smaller on the average than the brains of whites; that the brains of the two races are of equal averages; that mulattoes are more intelligent and less intelligent than full bloods; that they are possessed of more disharmony and of less disharmony of type than the white race; that war is increasing and decreasing; that it is good and bad for the human race; that monozygotic twins have concordant careers and that they do not have concordant careers; that there is more insanity among males than among females and vice versa; that the most favorable working temperature is higher and lower than a certain level; that the trend of progress is coldward and that it is in the opposite direction; that the bodily form of the children of immigrants changes and that

[105] W. F. Ogburn, *op. cit.*, pp. 12-20.

it does not change; that statistics on climate and mental efficiency show contradictory results; that genius is hereditary and that it is not; that social constants are all variables; that skin color is an index to mentality and that blonds and brunettes are both superior; that there is and there is not a distinct differentiation in the cranial capacity of races; that brain size is correlated with mentality but that mentality is not correlated with brain size; and that social work contributes to degeneration while preventing racial degeneration!

There must be an end of this recital somewhere. The men who have come to these opposite conclusions are earnest and hardworking men. Their seriousness is unquestionable and their works do follow them. They have, to the last man, "followed the gleam" wherever the imagination has led them. There have been statistics good and bad; but that does not matter so much. What counts is the difference between controlled and uncontrolled imagination in the use of statistics.[106] Valid statistics are the work of the man with an active imagination rationally controlled; bad statistics are the outcome of imagination without rational controls. We must therefore blame imagination and not statistics after all for applying the same type of measurements to cabbages and kings, since the man of uncontrolled imagination observes just as many "eccentricities" in the cabbages.

X. IMAGINATION IN THE INVENTION OF RESEARCH TECHNIQUES

To sum up the part played by imagination in the invention of research techniques, one has but to read a history of statistics, such as Walker's,[107] note the steps taken in the process, find that one of the first advances made on *probability* was the attempt of a monk to help a gambler settle up with his opponent in an interrupted series of games of chance, and that one of the indispensable devices of the statistician, the correlation coefficient, was the discovery of Sir Francis Galton in 1889. In that year he published *Natural Inheritance*. "Starting from the relation between parents and offspring, he passed to the idea of a coefficient measuring the correlation between pairs of individual measurements."[108] Then there is the work of Quetelet, who invented "the average man," "moral statistics" on such subjects as crimes, suicides, and marriages, laid plans for census-

[106] Ellsworth Huntington's *Season of Birth* (New York, 1938) may not be "meteorological magic," but for all the statistics it contains, it cannot be much better.

[107] *Studies in the History of Statistical Method* (Baltimore, 1929).

[108] Ogburn and Goldenweiser, *op. cit.*, p. 167.

taking, criticism of sources, arrangement of materials, and helped solve problems relative to securing "uniformity and comparability of data."[109] Then there are such achievements as John Graunt's mortality statistics and Karl Pearson's *Chances of Death*,[110] which owes much to the imagery of the representations of the dance of death in the Middle Ages and to the *Vision of Mirza* of the bridge of death for inspiration and suggestions. Pearson's work is strikingly imaginative, though not always followed through and controlled by logical criticism. And, as a final instance, taken at random, there is F. S. Chapin's invention of a way to make a "statistical definition of a societal variable," which is likewise a product of imagination.[111]

It might be well at this point to close the discussion of the invention of techniques with an appeal to a single book concerned with studies of personality, which well exemplifies the fact that significant techniques and instruments of precision are themselves the products of the creative imagination.

On turning the pages of *Readings in Experimental Psychology*,[112] the first thing one sees is Sanford's Vernier Chronoscope (illustrated) and Bergstrom's Chronoscope (illustrated) on opposite pages. Then come a "complicated arrangement of implements permitting measures to be made on reaction times to sound, touch, etc.," several other chronoscopes, kymographs, the Weiler apparatus, an internal timer, the Renshaw Polygraph, an instrument for recording stomach contractions, a hand dynamometer, various mazes for studying human nature through rat nature, the Tycos Sphygmamometer, and other devices, "world without end." Then, when the reader goes back over the book to see what these instruments measure, he finds necessary a long imaginative jump from the data actually measured to the generalizations about human nature supposedly indicated. One of the most direct relations discovered is that of stomach contractions to hunger and hunger activity; yet activity is hardly ever related in man to hunger alone.[113]

[109] F. H. Hankins, *Adolphe Quetelet as a Statistician* (New York, 1908), pp. 41, 83, 105, cited from Odum and Jocher, *An Introduction to Social Research* (New York, 1929), p. 287.

[110] Chapter I and frontispiece.

[111] F. S. Chapin, "The Statistical Definition of a Societal Variable," *American Journal of Sociology*, XXX (1925), 154-176.

[112] W. L. Valentine (ed.), New York, 1931.

[113] A. L. Porterfield, "Imagination in Social Research," *Sociology and Social Research*, XX (1936), 227.

In conclusion, after reviewing the foregoing procedures in scientific research, we may conclude that, to get results in either the physical or the social sciences, gathering and ordering data will not be enough. Significant questions, entering hypotheses, tentative generalizations before looking into all the facts; examining facts within a certain range to see whether a tentative hypothesis squares with them; if so, proceeding, if not so, looking for another tentative hypothesis; scrutinizing details, and always bringing the facts into some sort of orderly relations—all this requires both industry and technique; but, first and last, it also requires imagination. Industry and technique may be acquired and facts may be piled up, but imagination that keeps its moorings while surveying the relations of investigative complexities is rare. Yet it is not so rare a quality of the human mind that it falls short of being the chief factor in the progress of scientific investigation.

PART III

THE INTERPLAY OF PSYCHOLOGICAL AND CULTURAL FACTORS IN SOME CREATIVE LEADERS IN SCIENCE

CHAPTER VII

A CREATIVE LEADER IN PHYSICAL SCIENCE: GALILEO GALILEI

"I have devoted my whole life to the study of Nature, and yet a single sentence may express all that I have done. I have shown that there is a correspondence between the succession of fishes in geological times and the different stages of their growth in the eggs—that was all. It chanced to be a result that was found to apply to other groups and has led to other conclusions of a like nature"—Louis Agassiz

"To know the man well by nature, as made by nature, and modified by accidents, surroundings, and conditions, including men, is to know his thoughts, and to a certain extent the causes of them and their motives. Philosophy is marching that way, history will soon follow—so will biography. . In proportion as this march is made, so dies blind bat-eyed hero worship. We are marching to the worship of Truth. . . ."—W. H Herndon on Lincoln

1. INTRODUCTORY

AN EARLIER chapter on "Flashes of Insight . . ." stresses the importance of creative imagination in the minds of individuals in furtherance of the cultural process. It also emphasizes the fact that what the individual discovers must emerge as a new configuration out of a general cultural background as a basis for the insight of the artist, scientist, or inventor. In Chapters VII-IX an attempt will be made to demonstrate still further the relation of the individual factor in men often called geniuses to the social process by asking: (1) How great a debt did each of these outstanding scientists owe to his cultural milieu, itself arising out of the past? (2) To what extent did personal-social, or primary group, factors enter into the construction of the ideal or the motive which propelled him? (3) How did this motive orient his attention in the direction of his distinctive discoveries? (4) How did he work and by what method? (5) What were the background and the motives of those who opposed him? (6) What did he achieve? and (7) To what extent did he influence, or become a factor in, the later field in which he expended his energies and made his discoveries? In short, how much did he derive from and give back to his particular stream of culture? Because of requirements of space and scope, Chapter IX will follow this plan less

closely than Chapters VII and VIII, as Galileo, Darwin, and Comte are considered in order.

II. THE INTERPLAY OF INDIVIDUAL AND CULTURAL FACTORS IN THE SCIENTIST

The contest between the "great man" theory of history and cultural determinism has had long standing. That both the "great man" theory and cultural determinism are in error is the present position. Rather, the social process goes forward by the interaction between the factors of individual minds and culture. Every individual's mind is, in the first place, a point of convergence of ideas and values flowing into his personality out of a given culture. Since, however, his experience is unique by virtue of the fact that (1) he belongs to one primary group, that is, one family or intimate association, rather than another, (2) he has a distinctive role in that group, if not in many others, (3) he has a private world because he has a separate body, (4) he makes many contingent contacts in unique circumstances, and (5) he is the result of a unique combination of genes in the chromosomes, what converges upon his personality out of his culture will be unique. Even if, uninspired by a dynamic motive and of less than average intelligence, he is a passive conformist, his personality organization will still be unique. If, on the other hand, he is of at least average intelligence and becomes fired by a dynamic set of values, his mind will not be a passive point of convergence for whatever flows toward him out of the cultural milieu. If he becomes nothing else, he will be either a missionary or a rebel. If he is of average intelligence without a commanding motive, he will lack much of the passivity of an automaton. He will at least be a dynamic screen of the cultural intake, and his responses will constitute a sharply modified outlet in group relations. If he possesses somewhat more than average intelligence, an advantageous position with reference to converging streams of ideas, and a "magnificent obsession" in the presence of other favorable elements in the total situation, he is likely to find a place in the hall of fame, while multitudes of others with equal intelligence die without notice.

"What, then," Spiller asks, "is the secret of greatness?" and, answering his own question, he suggests:

> Given that some very widely and exceptionally valued idea has historically evolved to the point of being almost within full grasp and that its complete

realization would be socially welcomed, then a man may attain to greatness if he passionately loves that idea and will make an almost superhuman effort under favorable individual and social circumstances to realize the idea through profiting fully by what has already been accomplished by his fellows and remaining forever bent on following, rivalling, and surpassing the best that has ever been produced and ever strives to better his own achievements.[1]

Granting the full force of what is here claimed for the factor of culture, the fact remains that intelligence and motive as factors in individual greatness must be looked for, the first in internal, and the second in primary group sources, whatever may come to the person out of the general culture. Why does this particular man "passionately love" a "widely and exceptionally valued idea," which "has historically evolved to the point of being almost within full grasp," rather than some other idea which has the same characteristics, yet opposite in consequences or in a different field in the same culture? Why does one have more devotion than another in the same family to an idea? Why more energy? Why more readiness to profit by the works of others and to improve upon them? What propels him on to martyrdom rather than making him a member of the inquisition?[2] Let us cite some notable examples of the interaction of individual, cultural, and personal-social factors.

III. PSYCHOLOGICAL AND CULTURAL FACTORS IN THE MAKING OF ARISTOTLE AND GALILEO

In almost every history of science, two names, widely separated in time, are linked together as representative of opposing philosophies which, in the end of one epoch and in the beginning of another, engaged in a bitter struggle. The genius of the earlier and authoritarian epoch was Aristotle; and the genius of the challenging epoch of experimental science was Galileo Galilei. Often those who discuss these two philosophers and scientists seem to conceive of Aristotle and Galileo as almost the sole creators of the conflicting systems which they, of course, did help to create and certainly do symbolize; but while they did not create these opposing systems without much help, they are surely more than convenient symbols of their representative ages. Just what is the truth in this matter?

Aristotle belonged to a flowering period in the history of Greece to which the eugenist often points in advancing the supremacy of the bio-

[1] G. Spiller, *The Origin and Nature of Man*, p. 358.

[2] See the valuable concept of "differential association" in E. H. Sutherland, *Principles of Criminology* (rev. ed.; New York, 1939), chap. i.

logical factor.[3] If Athens produced more than a dozen really great men in less than a hundred years and twenty-five in two hundred years, how many should Rhode Island have produced since Roger Williams?[4] This simple question indicates, in those who ask it, a position the very opposite of cultural determinism. It implies that these men made Grecian culture and not vice versa; but in this implication or its opposite there is error.

Barnes,[5] Giddings,[6] Hertzler,[7] and others have pointed out the manner in which the civilizations of Egypt, Babylonia, and Assyria eliminated local conflict and, as Barnes shows, built governmental organizations that would release men for nonmilitary activities; and, without reaching it themselves, they paved the way for the Hellenic development of the "legal-liberal" stage of civilization, while furnishing a rich stream of culture to a people whose experience in the Mediterranean world made them capable of appreciating "unlike-mindedness," and capable, too, of studying human behavior and institutions. Sparta, Thessaly, and Thebes were never intellectual because they had a different orientation from the city of Athens. With her democracy and her intellectual orientation, Athens drew scholars and artists from the entire peninsula; capable men who would naturally go where they were appreciated.[8] The school of eugenists might do well to consider the influence of this scholarly immigration upon greatness in Athens.

Aristotle was born a Macedonian and came to Athens to study under Plato, with whom he continued for twenty years. He thus had the finest education that could be afforded, which, along with much else, included the whole body of Hellenistic philosophic tradition. The cultures of the earth converged upon Hellas and upon Athens; and the ideas of all the Athenians were made available to Aristotle, who, free all his life from the struggle for existence and, it is said, endowed for research by the court of Macedon,[9] had nothing to do but to play with ideas. In other words, as George S. Brett says: "Aristotle stood at the very end of the

[3] Francis Galton, *Hereditary Genius* (London, 1892).

[4] E. G. Conklin, *Heredity and Environment*, p. 299.

[5] Harry Elmer Barnes, *An Intellectual and Cultural History of the Western World* (New York, 1937), p. 119.

[6] F. H. Giddings, cited in Barnes, *loc. cit.*

[7] Joyce Hertzler, *History of Social Thought in Ancient Civilizations* (New York, 1937).

[8] H. E. Barnes, *op. cit.*, p. 118. As a matter of fact, Miltiades, Aristotle, Aristophanes, Euripides, Lysias, and Polygnotus, named by Conklin among twenty-five Athenians, were all immigrants. Others did not belong to either the old or the new nobility.

[9] C. A. Ellwood, *History of Social Philosophy* (New York, 1938), p. 38.

classical Greek development and was himself a diligent student, owing his completeness and finality to the fact that he was able to incorporate in his work all that seemed to him valuable in the earlier schools of thought."[10]

These facts are in accord with Spiller's prerequisite for individual greatness; that a man must stand close in place and time to an intellectual process almost complete within the social process itself before he can seize upon the key to its completion.[11]

We must not overlook the fact, however, that many others stood as close to the completion of the Hellenistic system of thought as did Aristotle; and yet there is but one Aristotle with the requisite passion, energy, and insight to make that system complete. It is said that perhaps no man except Leonardo da Vinci has ever excelled him in intellectual versatility, few have ever rivaled him in intellectual power, and none has ever matched him in the scope and number of his writings. He was the most influential of all logicians, was the founder of metaphysics, "was the first to work out a synthetic doctrine of causation,"[12] proved himself an astounding influence in theology and ethics, and established a comprehensive system of physics; and, as Harry Elmer Barnes expresses it, he

> . . . was not only the intellectual giant of his day; he exerted a tremendous influence upon human thought from his age to our own. . . . His philosophy and some of his scientific efforts were carried along by his students . . . until 529, when Justinian closed all the Athenian schools. . . . Most of his major works which have survived were . . . preserved . . . in the Greek or Eastern empire. The Muslim scholars translated them into Arabic. . . . But the intellectual omnipotence of Aristotle developed in the Christian West after Abelard, in the twelfth century, had made logic indispensable in Christian theology. . . . His teleology and its implied theology made his works palatable to the Christians. God was the prime mover. The heavens, with their circular motion and their derivation from the mysterious "fifth element," were superior to the earth. His fourth cause implied that there was a divine purpose in the universe. Hence, the medieval Christians could accept Aristotle with much more relish than they could have received an anti-religious writer like Lucretius.[13]

The effect of this acceptance of Aristotle calls up two points made by Spiller: (1) that the ideas a culture accepts will depend upon the fitness of these ideas for configuration with the other elements of that culture,

[10] George S. Brett, *Psychology, Ancient and Modern* (London, 1928), pp. 6-7.
[11] Spiller, *op. cit.*, pp. 356-359.
[12] H. E. Barnes, *op. cit.*, p. 142. [13] *Ibid.*, pp. 144-145.

so that a man who is out of step is passed by unnoticed; and (2) that a great man arriving near the end of one culture epoch may serve to perpetuate ideas that should have been permitted to perish; ideas that serve as shackles on the future.[14]

Spiller's first proposition is substantiated by the data which show that the fame accorded to a discoverer and his influence over subsequent ages in a given culture depend to a great extent upon whether he supports or opposes the "idea-forces" of that culture.[15] Aryabhatta, for instance, a Hindu astronomer, apparently held in his writings that the earth is a sphere which revolves upon its axis. He seems to have been the first correctly to understand solar and lunar eclipses, and, from that, we may infer that he taught that the moon revolves about the earth and the earth about the sun.[16] The Hindus and the Arabians accepted this doctrine, unknown in Europe for many centuries afterwards, because they did not find it in conflict with their sacred writings. Yet, a "thousand years later," as Van Wagenen says, "when the same beliefs were expressed by Copernicus, they were received with horror because they were considered to be in opposition to the teachings of the Christian Church."[17]

When Galileo arrived upon the scene, he found European universities and the church wearing these Aristotelian authoritarian shackles; not, however, because Aristotle's method was deductive, or because he had not reached, though he did adumbrate, the experimental stage of science, but because the church was looking for just such support as Aristotle had to give. It was the meat and drink of an Abelard and an Aquinas. Yet, if Aristotle had lived in Galileo's time and had stood relatively to that time as Galileo stood, we might not hear so much of the latter today.

Galileo was by no means the first to call in question the scientific authority of Aristotle, though he was the first to produce a marked general effect.[18] We have already observed, in connection with the name of Aryabhatta, something of the Hindu-Arabian tradition with which Gali-

[14] Spiller, *op. cit.*, p. 367, on this point quotes James M. Baldwin, *The Story of the Mind* (London, 1899), p. 367.

[15] Alfred Fouillée, *Le mouvement positiviste et la conception sociologique du monde* (Paris, 1896), p. 244; cf. Karl Lamprecht, *What Is History?* chaps. iii-iv, cited in Ellwood, *Psychology of Human Society*, p. 241.

[16] Theodore Van Wagenen, *Beacon Lights of Science* (New York, 1924), pp. 41-42.

[17] *Loc. cit.*

[18] *Life of Galileo Galilei* (a valuable work, the best life of Galileo I have been able to find, judging by various sources, although published anonymously as a volume in the "Scholar's Cabinet Library," by William Hyde and Company, Boston, 1832), p. 31.

leo was acquainted through his study of mathematics. Nizzoli, early in the sixteenth century, had condemned Aristotle's physics, saying that there were more false, useless, even ridiculous propositions than true ones advanced by the famous philosopher on that subject.[19] Benedetti had confuted several propositions in Aristotle's mechanics by the time Galileo was born. Mazento, who preserved Leonardo da Vinci's manuscripts, was a student with Galileo at Pisa, and Leonardo foreshadowed Galileo.[20] Copernicus had published his *De Revolutionibus* in 1543. Giordano Bruno had been burnt at Rome in 1600 for ridiculing the Aristotelians as being "ready to live and die for Aristotle" without understanding "even so much as the titles in Aristotle's chapters."[21] Francis Bacon, though Galileo was probably influenced by him not at all as a contemporary, had decided as early as his fifteenth year that the method of the Aristotelians was barren; but Bacon's induction without deduction was just as barren.[22]

To go much further back, however, Greek travelers and traders and Alexander's conquests had carried Greek science to India. The Hindus had preserved it and had passed it back toward Europe by way of Bagdad through the channel of such teachers as Al Khuwarismi (d. 831), who had learned it from the Hindus and become lecturers at Bagdad.[23] Such Hindus as Brahmagupta,[24] who wrote on mathematics in A.D. 628, knew Euclid and Archimedes and actually improved arithmetic and algebra, though not geometry. Brahmagupta was the first man known to use Arabic numerals and common fractions; and a Hindu, Bhoskara, appears originally to have conceived of decimals about A.D. 1150;[25] but Simon Steven (1548-1620) was the first to use the decimal system of notation after the infiltration of the Hindu-Arabic culture through Bagdad, Cordova, and the Spanish Moors into Europe.[26]

In Europe, Commandine began to revive Euclid and Archimedes as a result of the ferment. Vieta Tartelea had taken up algebra, Guido Ubaldi and Benedetti had delved into statics, and Ricci was a professor of mathematics in the University of Pisa in Galileo's home city when

[19] *Ibid.*, p. 31. [20] *Ibid.*, p. 32. [21] *Ibid.*, p. 36.

[22] *Ibid.*, pp. 14-16; see also J. F. Rowbottom, *Story Life of Great Scientists* (New York, n. d.), p. 6. [23] H. E. Barnes, *op. cit.*, pp. 494-495.

[24] Van Wagenen, *op. cit.*, pp. 41 ff. [25] *Loc. cit.*

[26] *Loc. cit.*; cf. W. T. Sedgwick and H. W. Tyler, *A Short History of Science* (New York, 1917), chap. viii on "Hindu and Arabian Science."

the youth began the study of medicine there in 1581.[27] Thus Galileo, at the age of nineteen, was introduced to Euclid and Archimedes as well as Galen, Hippocrates, and Aristotle.

IV. FACTORS IN GALILEO'S MOTIVATION AND HIS GROWTH

The reasons that Galileo was not caught up by the authoritarian rather than the experimental mode of thinking, then, are not to be sought in the general cultural milieu so much as in the personal-social relations in which he moved, intimately, and in the contingent events which formed channels through which the experimental, more youthful phase rather than the authoritarian, more highly and widely valued phase of culture could converge upon his growing mind. He stood, thus, close to a valued idea about ready to emerge—an instrumental idea, which, in the minds of imaginative men free from the Baconian glassy-eye movement which, at about the same time, was being born, has perpetually produced the most valuable scientific goods.

Galileo's father must early have taught him to maintain an open, questioning mind; for the elder Galilei one time made a statement which justly became famous in the history of science. Vincenzo Galilei, talented, and educated in mathematics and music, published several esteemed treatises. In one of these he said:

> It appears to me that they who in proof of any assertion rely simply on the weight of authority, without adducing any argument in support of it, act very absurdly: I, on the contrary, wish to be allowed freely to question and freely to answer you without any sort of adulation, as well becomes those who are truly in search of truth.[28]

The fact that one of Galileo's younger brothers was christened Michel Angelo may be indicative of the family tradition. That Galileo rather than either of his brothers became the scientist need not be wholly attributed to a superior mind. The roles in which their lives were cast consumed their time and helped to orient their minds in different directions. Michel Angelo Galilei, for example, got "an advantageous settlement in Poland"; but advantageous for what? He proved to be a moral weakling and a ne'er-do-well, but there is evidence that he, too, was interested in "natural history."[29] Galileo's active, creative mind, as greatly as all the gifts made to him by his culture, must be emphasized. Its

[27] *Life of Galileo Galilei*, pp. 24-28.
[28] *Ibid.*, p. 21.
[29] *Ibid.*, p. 23.

power must not be discredited by any cultural determinist. In his childhood he invented numerous toys, as Newton did. He studied, in his pre-university days, literature and music and was so fond of painting that he once wanted to make painting his profession.[30]

Versatility is a quality ascribed to many-sided personalities. Socrates, Plato, Aristotle, Theophrastus, Marcus Aurelius, Roger Bacon, Pope Sylvester II, Pascal, Newton, Michel Angelo, Leonardo da Vinci, Francis Bacon, Benjamin Franklin, and Sir Oliver Lodge, each turns the facets of his personality, as did Galileo, about in the midst of a cultural ferment until the light reflected through great praise or opposition indicates the brightest facet and becomes one factor in motivating the versatile person to keep that facet forward. Sometimes, as in Leonardo, several facets appear luminous, or different facets shine brighter at different periods of life. Galileo turned first one and then another facet of his personal-social self about, as youth is wont to do, until the questioning, exploring attitude was exposed steadily to his surroundings; and, as he moved step by step, the ends which motivated his means were replaced by the means as new ends in themselves, so that the facet that was first turned to view helped to determine the facet that would be showing next. For he wanted to study mathematics in connection with the theory of music, and he wanted to experiment in preparation for the study of medicine. When he studied mathematics he became acquainted with Archimedes and became interested in Archimedean and mechanical principles. When he began to experiment, the elation and the opposition gave a high value to the process itself. Furthermore, he had become convinced, even in his student days, that he was "capable of giving the world an example of a sounder and more original mode of thinking":

> He felt himself destined to be the founder of a new school of rational and experimental philosophy . . . and it is difficult at this time fully to appreciate the obstacles which then presented themselves to free inquiry. . . . The vindictive rancor with which the partisans of the old philosophy never ceased to assail Galileo is itself sufficient proof of the prominent station which he occupied in the contest.[31]

This very opposition made him the more convinced that the goal of a new experimental philosophy was desirable. So motivated, he created in his study days at Pisa a pulsilogy; while an instructor in the same school, he demonstrated the error in the Aristotelian theory of falling

[30] *Ibid.*, p. 24. [31] *Ibid.*, p. 25.

bodies. Later, he developed a thermometer, a compass of proportion, invented a telescope and a microscope, discovered the moons of Jupiter, made observations on the moon, nebulae, Saturn, Venus, and Mars, discovered spots on the sun, wrote on floating bodies, furthered the application of astronomical knowledge to problems of navigation, discovered the acceleration of falling bodies by the use of inclined planes, wrote dialogues on the world system, and developed the pendulum into a clock.[32] These things did not flow mechanically out of his background; and the fact that different men, working independently, often make the same discoveries at about the same time is no evidence that they did.[33] Neither did they appear to a Baconian glassy-eye. They were the result of a juxtaposition of a mass of cultural data in the same mind, selectively brought there, with a rich and controlled imagination—an imagination controlled by reason and experimentation. And the role of the Galileian imagination may be seen in his method of attack upon the specific scientific problems that he faced.

V. IMAGINATION IN THE GALILEIAN METHOD

When Galileo was a student at Pisa, his attention was arrested one day in the cathedral by a swinging lamp. The vibrations, whether great or small, seemed to occur at equal intervals. No one knows, of course, how many persons before Galileo had considered the equality of the time intervals required of such a pendulum in sweeping through unequal arcs; but Galileo, being a medical student, saw the relation of pulse-time to pendulum-time, counted his pulse, and established the equality of the time intervals involved. The significance of this fact emerged out of a mental-emotional ground as an "educed correlate"; that is, a new configuration had arisen in the form of an instrument for measuring the patient's pulse. For this purpose he later constructed his first pendulum. Later in life, in new situations, the pendulum for Galileo became part of a clock.

After Galileo turned from the study of medicine to mathematics and became a lecturer in the University of Pisa on the latter subject at the age of twenty-six (1589), as we have seen, he challenged Aristotle's idea

[32] *Ibid.*, throughout; cf. Sedgwick and Tyler, *op. cit.*, pp. 217-226, and Henry Smith Williams, *A History of Science* (New York and London, 1904), II, 76-123.

[33] The fact that Tycho Brahe, Kepler, and Galileo all worked in the field of astronomy at the same time in no way clouds the brilliance of any one of them. Of course they all owed much to Copernicus.

that two bodies of the same material, but of different weights, would fall at different rates. According to Aristotle, a ten-pound ball would reach the ground in one tenth the time consumed by a one-pound ball when released from the same height. Galileo's colleagues thought it foolish to dispute Aristotle; but he managed to drop two such balls in their presence from the tower of Pisa.

This event shows how the emotions of his opponents kept them from being convinced and put them on his trail as a dangerous foe, thus increasing his ardor. The same attitude prevailed in his colleagues at Padua upon his invention of the telescope.

At the time of its invention in 1609, he had served as professor of mathematics in Padua since 1592. The changes that had taken place in his life since the Pisa event were described by Galileo in a letter, just before he made this discovery, to Cosmo, Duke of Tuscany, who was urging him to return to Pisa. He said in part:

> The works which I have finished are, principally . . . two books on the system or structure of the universe, an immense work, full of philosophy, astronomy, and geometry; three books on Local Motion, *a science entirely new, no one, either ancient or modern, having discovered any of the very admirable accidents which I demonstrate in natural and violent motions, so that I may, with very great reason call it a new science, and invented by me from its very first principles;* [and] three books of mechanics . . . I have also different treatises [on sound, speech, light and colors, the tide, continuous quantities, the motions of animals, and the compass].[34]

Galileo, in fact, had become so absorbed in experimentation by now that one condition he required of the Duke for his return to Pisa was freedom from teaching.

While he was considering the Duke's proposition, Galileo heard, at the house of a friend in Venice, of a Hollander who, a year previously, had invented a strange instrument which could make far things appear near. A few days afterward, a friend in Paris wrote him to the effect that the instrument was a tube with a lens in either end of it. Back in Padua, Galileo went to work on a telescope of his own—the first real telescope. Finally, he procured a couple of lenses from a spectacle-maker, one plano-concave, the other plano-convex, and set them in the ends of a lead pipe. This instrument magnified objects by three diameters. Of the method of discovery, he relates:

[34] *Life of Galileo Galilei*, p. 64. Italics are mine.

I argued in the following manner. The contrivance consists either of one glass or of more. . . . One is not sufficient since it must be either convex, concave, or plane; the last does not produce any sensible alteration in objects, the concave diminishes them; it is true that the convex magnifies, but it renders them confused and indistinct; consequently, one glass is insufficient to produce the desired effect. Proceeding to consider two glasses, and bearing in mind that the plane glass causes no change, I determined that the instrument could not consist of the combination of a plane glass with either of the other two. I therefore applied myself to make experiments on combinations of the other two kinds, and thus obtained that of which I was in search.[35]

The inventor's method was not blind fumbling, trial and error, or psychic accident. Experimentation did not even begin until the experimenter had done some sound reasoning. And, when he had finished the first telescope by this method, he returned with it to Venice, where it attracted so much attention that he was urged by the Doge to present it to the senate, which, in turn, elected him to a professorship in Padua for life.[36] He then went to work and made a telescope that would magnify by thirty diameters, which he eagerly turned upon the moon, discovering the mountains, and upon the planets, revealing, not points of light but disks. Thus, Galileo, thoroughly aroused, went to work on a still more powerful telescope, which he turned upon Jupiter on the night of January 7, 1610.

Quickly he detected three "new stars" close to Jupiter, nearly on a line, two east and one west of the planet, but he did not understand that these were really moons of Jupiter. On the next night, he saw all three of these on the west side, differently arranged. Two nights later one was out of sight and the other two were on the east side. That put Galileo to wondering whether something was wrong with the telescope. The next night only two "stars" appeared, both on the east, but one was twice as large as the other. On the night of January 13 he saw all four of Jupiter's moons. Then he knew the explanation of these phenomena, but he did not announce his discovery until January 22.[37]

VI. UNSCIENTIFIC IMAGINATION IN GALILEO'S OPPOSITION

While Kepler readily gave up his "Cosmographic Mystery" to accept Galileo's new discovery of the moons of Jupiter,[38] less scientific minds

[35] *Ibid.*, pp. 79-80.

[36] See the quotation from J. J. Fahie, *Galileo, His Life and Work*, in Sedgwick and Tyler, *op. cit.*, pp. 219-220.

[37] See the account from David Brewster, *Martyrs of Science*, in Sedgwick and Tyler, *op. cit.*, pp. 220-221.

[38] Fahie in Sedgwick and Tyler, *op. cit.*, pp. 222-223.

conceded him nothing; and the uncontrolled imagination of the opposition is demonstrated by the argument of Francesco Sizzi, a Florentine astronomer, who, disproving the possibility of Galileo's discovery, affirmed:

> There are seven windows given to animals in the domicile of the head . . . which are the principal parts of the [microcosm, or little world]; two nostrils, two eyes, two ears, and a mouth; so in the heavens, as in a [macrocosm, or great world], there are two favorable stars, two unpropitious, two luminaries, and Mercury alone undecided and indifferent. From which and from many other similar phenomena of nature, such as the seven metals . . . we gather that the number of planets is necessarily seven. . . . [Many peoples] have adopted the division of the week into seven days, and have named them from the seven planets; now if we increase the number of the planets, this whole system falls to the ground.[39]

As for the principal professor of philosophy at Padua, he refused to look through the telescope for fear that "the whole system would fall to the ground."

It is impossible to follow the discoveries of Galileo further in spite of the fact that some of his most valuable work in which he displayed a great capacity for imagination and fruitful insights was performed with falling bodies on inclined planes.[40] But this valuable work was not what caused his trouble. He really came into disfavor with Urban when the latter supposed Galileo had ridiculed him in a work published in 1632 on *The Two Principal Systems of the World, the Ptolemaic and the Copernican,* which, in the form of a dialogue, purported to present arguments equally for both systems.[41] Pope Urban was persuaded by Galileo's enemies that the astronomer and physicist had represented him in the character of the simpleton, Simplicio, who stood for Aristotle and the Ptolemaic system. In spite of all his friends could do, Galileo was charged by the Inquisition with teaching that "the sun is the center of the world and immovable from its place," a doctrine which is "absurd, philosophically false, and . . . formally heretical; because it is expressly contrary to Holy Scripture"; and that "the earth is not the center of the world, nor immovable, but that it moves, and also with a diurnal motion," a

[39] *Life of Galileo Galilei,* pp. 91-92.

[40] Henry Smith Williams, *A History of Science,* II, 100; see Sedgwick and Tyler, *op. cit.,* pp. 247-248, quoting Galileo.

[41] Parts of this dialogue are contained in Henry Smith Williams, *ibid.,* pp. 84-90.

proposition which the church treated as it did the other one—as "absurd," "false," and "erroneous in faith."[42]

Galileo had promised years before that he would not teach the Copernican system as necessarily true, and now he was charged with breaking that promise. On June 22, 1633, in the Convent of Minerva at Rome, he, accordingly, made his famous abjuration, which begins: "I Galileo Galilei . . . aged 70 years, being brought personally to judgment, and kneeling before you, Most Eminent and Reverent Lords, Cardinals, General Inquisitors of the Universal Christian Republic against heretical depravity, having before my eyes the Holy Gospels, which I touch with my own hands, swear. . . ."[43]

Then Galileo had to say that he had always believed every article in the creed of the church, that he had broken his former promise not to teach the Copernican system as true, that he would henceforth hold that system as untrue, that he would publicly denounce anyone disagreeing with the church, and that if he broke any further promises, he would subject himself to all the pains and punishments decreed by the canon against such delinquents.

That Galileo, as he rose from his knees, whispered to one of his friends, "It does move, though," may not be true. But this much is true. When Galileo Galilei, quite blind and nearly deaf, after a long, laborious life, full of fruitful insights, died on January 8, 1642, he had taken his cultural heritage, enriched it, and returned to his world a far greater bequest than he had received. Since Galileo, a world that has been "waiting for the sunrise" of science "does move though." In the immediate ferment moved such men as Kepler, Robert Boyle, Robert Hooke, and Christian Huygens; and in less than a year after the death of Galileo Isaac Newton was born.[44]

VII. THE CONTRIBUTION OF GALILEO

The contribution of Galileo has been more or less indicated by the preceding sections in this chapter; but there seems to be room for this final suggestion. Galileo and the men who lived in his epoch paved the

[42] *Life of Galileo Galilei*, pp. 179-185.

[43] *Ibid.*, pp. 188-190, and Sedgwick and Tyler, *op. cit.*, "Appendix E," for the "Condemnation" and the "Recantation."

[44] Benjamin Ginsburg, *The Adventure of Science* (New York, 1930), pp. 97-125, and W. C. D. Dampier-Whetman, *A Short History of Science* (New York, 1931), also have some good data on Galileo.

way for the technological progress and the mechanistic emphasis of the next three centuries. They are not responsible for the fact, however, that technology has overwhelmed us, and that physical science has made such rapid strides, while we seem to have made relatively little progress in the social sciences since Aristotle. Nor are they to be credited with the parentage of the present-day emphasis often put upon physical science methods in social science. As a matter of fact, Gestalt psychologists are at present emphasizing the usefulness of the Galilean methodology in the development of field theory in the social sciences, as we have seen, in a way that proves not at all congenial to those who ape physical science methods in the social sciences.[45]

Not the least contribution made by Galileo to all the sciences was the contribution of a broad method, calling not only for the use of experimentation but for the use of the imagination in the development of appropriate techniques and controls in his search for the truth.

[45] For the uses that are being made of Galilean as over against Aristotelian methodology in psychology and other social sciences, we may again call attention to Kurt Lewin, *A Dynamic Theory of Personality*, chap. 1, and N. F. Cantor, *Crime and Society*, pp. 57-64.

CHAPTER VIII

A CREATIVE LEADER IN THE SCIENCE OF LIFE: CHARLES DARWIN

"Those who refuse to go beyond fact rarely get as far as fact; and anyone who has studied the history of science knows that almost every great step therein has been made by the 'anticipation of nature,' that is, by the invention of a hypothesis which, though verifiable, often had little foundation to start with; and not infrequently, in spite of a long career of usefulness, turned out to be wholly erroneous in the long run."—Thomas Henry Huxley

"All men are agreed . . . that real knowledge must be founded upon observation. But no science could have its origin in simple observation alone; for if, on the one hand, all theories must be founded on observation, on the other, it is equally necessary to have some sort of theory before we address ourselves to the task of steady observation. If, in contemplating phenomena, we do not connect them by some principle, it would . . . be impossible for us to combine our isolated observation . . . (or) even to retain them."—George Henry Lewes

I. INTRODUCTORY

IN THE OPENING lines of *The Evolution of Charles Darwin,* George A. Dorsey writes:

If one speaks of geniuses, one must speak of Darwin; if one speaks of immortal discoveries, one must speak of Darwin; if one speaks of revolutions in the basic concepts of nature, one must speak of Darwin; and if one speaks of individual performances which have become part of [the] human heritage and which have changed the further course of all human endeavor, one must speak of Darwin first. Therein is Darwin's greatness. He was unique in the character and scope of his personality and the extent to which he changed the beliefs of the civilized world.[1]

The object of this warm compliment, curiously bestowed by a psychologist who mistakes him for a methodological kinsman, was born on February 12, 1809—the birthday of Abraham Lincoln. It would be most interesting, of course, to speculate, as Dorsey suggests, what would have been the result if "some magician had made an instantaneous exchange of babies—dropped the new-born Abraham into Susannah's arms and the new-born Charles into Nancy's arms";[2] for no two men were ever intro-

[1] New York, 1927, p. 1. [2] *Ibid.,* p. 7.

duced in infancy to more contrasting situations than those in which Susannah Wedgewood Darwin and Nancy Hanks Lincoln lived. In no way were the opportunities of the two babies equal except, perhaps, in the qualities of their mothers. Robert Waring Darwin, Charles' father, was a physician so capable that the by-product of his practice was a sizable fortune. Lincoln's father was a worthless backwoodsman. Charles Darwin's grandfather, Erasmus Darwin, was a notable doctor, a scientist, and a poet. It has been suggested that the celebrated American's ancestry is best undiscussed.[3] A rich social heritage flowed all about the English child. Lincoln had to borrow books from afar and read them by the light of a pine knot. Lincoln was born in the woods and became a statesman; Darwin was born in a very different milieu, fell in love with the woods, and became a naturalist. In denying that heredity shaped the course of their lives, Dorsey says that both were just like any other normal newborns with the "capacity to learn any way of somatic behavior that any human being had ever learned"; that the only limitations on the patterns that any child may learn are such as keep bass vocal chords from singing soprano or lightweight champions from becoming heavyweight champions of the world.[4] We cannot be sure, however, that there are no inherited mental differences in those who are "normal," affecting performance, and comparable to those enumerated above. Assuming, however, that there are not, Dorsey continues to show how Lincoln and Darwin were shaped by purely behavioristic conditioning.

> Born without knowledge, they learned; born without trained hands and voices, they learned to use both; born without specific fears, hates, loves, they learned specific fears, hates, loves . . . born hungry they acquired specific appetites. When the sex hunger drove them, they acquired specific mates. . . .[5]

And, to continue, when a great idea drove them into very different activities, they attained specific achievements, and each made his specific contribution to his culture. There is no reason for supposing, however, that Lincoln exchanged for Darwin on the day of his birth would have been what he or Darwin really was, and vice versa. Whatever either would have done in the other's place, we know something of how each was affected in his own place as the forces of family and of the greater society to which he belonged played upon him. All the forces—and we

[3] Emanuel Hertz, *The Hidden Lincoln* (New York, 1938), contains many letters of W. H. Herndon about Lincoln.

[4] Dorsey, *op. cit.*, p. 7.

[5] *Loc. cit.*

cannot possibly know them all—that converged upon the life of each never formed a similar configuration in the life of any other man. Each gave selective attention to his world, and each had a very different culture out of which to select the stimuli to his behavior. Barnacles, the fauna of the Galapagos, cuttlefish, earthworms, and coral reefs were of little interest to Lincoln. Of course, they were not thrust upon him while the political issues of his nation were close at hand; but these political issues should have had closer proximity to others than to this uncultured frontiersman in America. And barnacles, the rich varieties of the Galapagos and of South America, the coral reefs did not impose themselves upon Darwin. He had to go to them. Why did he do it?

In answer to this question, behavioristic explanations are not enough. Instinctivist and hereditarian explanations are no better. Darwin's capacity for intelligence, memory, observation, analysis, insight, and synthesis as achieving forces; the original and acquired, constant or variable, attractiveness of various stimuli to him, together with his original and acquired, constant or variable, organic responsiveness as driving forces; the cultural and physical barriers which he faced, his health, his role, his social sphere, his psychological remoteness and nearness to persons and ideas, and contingent experiences as restraining and facilitating forces—all these driving, achieving, restraining, and facilitating forces which converge in kaleidoscopic ways in the behavioral fields of human personalities, resulting in action toward the attainment of greater and lesser specific goals, formed a unique configuration in the life of Charles Darwin to which neither instinctivist nor behaviorist owns a key. And we can speak glibly about the total situation in human behavior, yet we can never know just what the total situation is. Still it is only by approaching as nearly as we may to such knowledge that we may understand the personality of Darwin or any other man; that we may know the valence of human emancipation for Lincoln and of coral reefs and barnacles for the celebrated naturalist who spent his life in the attempt to understand the origin of the species, including his own.[6]

As we have seen, Charles Darwin was most fortunate in his family. Dorsey stresses the influence of the mother on her son; yet Darwin tells us that he remembered very little about his mother, who died when he was no more than eight years of age.[7] Dorsey and Kempf hold that

[6] Cf. Kurt Lewin, *A Dynamic Theory of Personality* (New York, 1935), chaps. iii-iv.
[7] Dorsey, *op. cit.*, pp. 14-23; cf. Darwin's *Life and Letters*, I, chap. ii.

Darwin's father was responsible for an inferiority complex in the boy; and Kempf even goes so far as to suggest that Darwin was an invalid most of his life, bordering even on mental disorder at times, as a result of the alleged harsh, unjust, and inconsiderate attitudes of his father. Although Kempf gives a whole chapter to Darwin on "The Mechanism of . . . Anxiety Neuroses," impressive and instructive as it is, the evidence does not support the position of either Dorsey or Kempf.[8] Robert Waring Darwin possessed a vast amount of sympathetic imagination, being somewhat of a psychiatrist before "the fulness" of psychiatric times.[9] True enough, he seemed to understand other personalities better than he understood the personality of his son. He objected to the latter making the voyage on the *Beagle,* and was inclined to think Charles somewhat of a wastrel; but once the voyage was made and the father gradually saw the result, we have the son's word for it that he later became his father's prime favorite. Of his mother, Dorsey writes:

> She was the favorite daughter of Josiah Wedgewood . . . was educated partly in London . . . and at home with her brothers under competent tutors; she had read widely and traveled extensively; but especially had she become the favorite of her father's great friend . . . Erasmus Darwin. All of which prejudiced her favorably toward her father-in-law. Erasmus Darwin was also a poet and a philosopher.[10]

Dorsey sees a link here between Susannah's son and his notable grandfather. He says that the evolution of the personality of the future-famous lad was well on its way before his mother's death; that "he had already acquired certain specific likes and dislikes; certain specific things, people, faces, situations, occupations made specific appeals to him. His innate curiosity had become specific in certain lines."[11]

Why did not the same interests and tendencies develop in the brother, "Poor old 'Ras,'" who "left no footprints on the sands of time"? As Dorsey says, it is true that "poor old 'Ras' never walked with Henslow; no voyage of the Beagle knocked at his door. Charles did walk with Henslow; he did make the voyage on the Beagle";[12] and, we may add, there are many other differences between the two that we can never know anything of. But, somehow, the study of nature got hold of Charles Darwin; and, after that, the urge was relentless. It would never

[8] Dorsey, *op. cit.*, pp. 89, 24-38; Kempf, *Psychopathology* (St. Louis, 1921), chap. vi.
[9] Dorsey, *op. cit.*, pp. 26-27; cf. Kempf, *op. cit.*, pp. 211-212.
[10] Dorsey, *op. cit.*, p. 18.
[11] *Ibid.*, p 22.
[12] *Ibid.*, pp. 39-54.

let him alone. It multiplied his energies in spite of sickness, whetted his intellect, and fired his imagination until he made one of the greatest contributions to his culture ever to be made by a single man.

Darwin knocked at various gates of activity, half-heartedly, however, before becoming a naturalist. He had no financial incentive to urge his entrance at any vocational door. He needed only to be a respectable gentleman; a man who pursued something for its own sake rather than for any extrinsic motive. His brother Erasmus, somehow, never found a really dominating purpose; and the father feared that Charles never would. He first tried medicine, at which his father predicted that he could succeed, but Charles could not perform operations without anesthetics. He then, at the suggestion of his father, tried preparation for the ministry, with the result that, at Cambridge, as at Shrewsbury and at Edinburgh, he neglected his formal studies to pursue his hobby of collecting. At Shrewsbury, his birthplace, where he studied from the age of nine to sixteen, the headmaster, the Reverend Samuel Butler, had called him a *poco curante*. He should have spent more time on Greek and Latin and less on experimenting with "all the gases." Darwin said that Butler's school, "as a means of education to me, was simply a blank." Henshaw Ward says that the famous headmaster, whose grandson is the author of *Erewhon,* "was blind and deaf and unfeeling in the midst of the marvels which all sensitive minds of the period were puzzling about."[13] But Darwin, even then, was collecting butterflies, beetles, birds' eggs, and minerals. It is not at all likely that his father and mother, before her death, disapproved of his boyish interests; the father, however, thought these interests, coupled with an urge to shoot and hunt, were not enough. At Edinburgh (1825), Charles showed some zest for medicine, but, finding lectures dull in *materia medica,* he was, as Ward says, "once more on his way to being a *poco curante*," indulging in collecting and observing. Drs. Grant and Coldstream at Edinburgh interested him in marine zoology, and he often accompanied Grant "to collect animals in the tidal pools." "When he inquired of Dr. Grant about certain little vesicles that floated in the water, the zoologist replied that they were the seeds of the brown rockweed which was abundant everywhere about; but Darwin wanted to see what was in the vesicles. As a result, he found in the vesicles, not rockweed, but a kind of leech."[14]

[13] Henshaw Ward, *Charles Darwin,* pp. 5-6.
[14] *Ibid.,* p. 13.

After two years at Edinburgh, he went to Cambridge to prepare for the church "with a bump of reverence developed enough for ten priests and with faith in the strict and literal truth of every word in the Bible";[15] but he nonetheless became a "gay young blade," who wasted a great deal of time and found much more interest in reading Humboldt's travels than in studying Paley's *Evidences of Christianity and Natural Theology*. The former, Darwin read over and over, talking about various passages when he went on his rambles with Henslow. Humboldt related his experiences in the South American forests and in the Canary Islands; and Darwin, as he read about them and walked and talked with Henslow, became so excited that a college-mate recalls his vehemence and eloquence when he spoke about them. In April, 1831, he wrote: "At present I talk, think, and dream of a scheme I have almost hatched for going to the Canary Islands. My friends sincerely wish me there, I plague them so with talking about tropical scenery."[16]

A few months later, Henslow recommended Darwin to Captain Fitz-Roy, who was going on the *Beagle* to survey the southern coast of Tierra del Fuego and other points of interest in a scientific circuit of the globe, as "being the best qualified person" he knew who was "likely to undertake such a situation" as that of a naturalist on the voyage. Darwin was elated. With the help of his uncle, who appreciated his "enlarged curiosity," Charles overcame his father's objections to his going as being "disreputable to his character as a clergyman"; and by talking for an evening with Fitz-Roy, he overcame the latter's objection to the shape of his nose. Thus began the major experience in the life of the man who was to advance natural selection as the method of biological evolution; and no insignificant part of that experience was his reading of a book while enroute: the *Principles of Geology* by Sir Charles Lyell.

II. THE SCIENTIFIC TRADITION SURROUNDING DARWIN

In Sir Charles Lyell's mind two streams of culture flowed side by side: the conservative religious tradition and the best of the scientific tradition. We have already noted, on the one hand, his view of the special creation of man and, on the other hand, his geological uniformitarianism. Influenced by these two cultural strands, Lyell's thinking about the relations of species was substantially as follows:

[15] *Ibid.*, p. 43.

[16] *Ibid.*, pp. 48-49.

(1) Just as hybrids had seemed to many thinkers to be the great clue to changes in life forms, so were they to Lyell. Darwin was himself much concerned with hybrids. . . . (2) Lyell urged that there are fixed limits beyond which descendants from common parents cannot deviate. There is no tendency to continual divergence from certain attributes with which the elephant was originally endued. . . . (3) One of the simplest but one of the most startling of Darwin's lines of reasoning was concerned with the marvelous ways in which seeds and eggs may be preserved and transported. Lyell offered some astonishing facts about modes of dispersal. . . . (4) The most spectacular and romantic sort of evidence for evolution is the series of changes through which every organism goes when it is an embryo. Lyell took stock of the evidence and argued that it is an illusion; a mere superficial resemblance. . . . (5) Lyell said much about the variations caused in species by climate and other conditions of life. He argued that, to some extent, these variations might be transmissible to offspring, but he was cautious about speculating, where Lamarck had recklessly made the most sweeping assumptions. The habits acquired from human tuition, said Lyell, are really transmissible to the offspring. . . . The question of inheriting acquired habits made Darwin's whole life uneasy, and is still disputed among biologists.[17]

To Lyell, whom Darwin was reading on the *Beagle,* it was apparent that there is a definite limit to variations, and that the variation is in consequence of the surroundings; but, to Darwin, who observed the species in the Galapagos Islands and on the continent of South America during the voyage, the limit of variation in an indefinite somewhat called a species was not so apparent. Finally, he wanted to know by what process of natural law food and climate cause variation. How could the gloomy darkness of the Falkland Islands cause a rat's nose to grow longer; or if somehow a nose was lengthened, how did this new length get into the ovum of a mother rat? The effort of visualizing these assumptions is too great for an experienced mind that has any curiosity about any other possibility.

That the vast majority of the naturalists of the time were not ready to visualize such possibilities as Charles Darwin did before he had returned from that voyage is most evident. They considered that the doctrine of evolution contradicted the Bible. It wounded human pride to claim kinship with such a creature as the monkey. But, most of all, as Benjamin Ginzburg says, "They were not prepared for a complete self-regulatory naturalism" such as the doctrine of natural selection presented.

[17] *Ibid.,* pp. 100-101.

"They were not prepared to make the necessary orientation in religious ideas."[18]

The best evidence of this lies in the manner in which Newton reconciled science and religion. Conceiving the universe, as we have seen, as a huge mechanism, he reserved for God the functions of cosmic mechanism of regulator of the universe. This conception was crystallized in religious apologetics in the work of Archbishop Paley on *The Evidences of Christianity and Natural Religion*. A mechanism presupposes a mechanician, he said. The argument was unimpeachable so long as science confined itself to enunciating universal mechanistic laws. Such science could never account for initial conditions or how the mechanism started; and for these things it was convenient to have recourse to a God outside the universe. Such a conception of God, although it was but a pale shadow of the God of tradition, nonetheless satisfied most of the upholders of religion.[19]

A further attitude toward the theory of evolution in Darwin's day is described by Alfred Russel Wallace in his *Darwinism:*

If any naturalist had been asked at that day whether, supposing it to be clearly shown that all the different species of each genus had been derived from some one ancestral species, and that a full and complete explanation were to be given of how each minute difference in form, colour, or structure might have originated, and how the several peculiarities of habit and of geographical distribution might have been brought about—whether if this were done, the "origin of species" would be discovered, the great mystery solved, he undoubtedly would have replied in the affirmative. He would probably have added that he never expected any such marvelous discovery to be made in his lifetime. But so much as this assuredly Mr. Darwin had done, not only in the opinion of his disciples and admirers but by the admission of those who doubt the completeness of his explanations.[20]

Now, we may ask: What were the steps in the cultural process leading up to this discovery? Just what was the nature of the discovery? What were the methods of discovery? What were its consequences? And what were the motives and methods of the opposition? We may first turn to the steps in evolutionary theory, as Osborn does, from the Greeks to Darwin, beginning with Heraclitus.[21]

[18] Benjamin Ginzburg, *The Adventure of Science* (New York, 1930), p. 286.

[19] *Loc. cit.*

[20] Alfred Russel Wallace, *Darwinism: An Exposition of the Theory of Natural Selection* (London, 1889 and 1912), pp. 6-7.

[21] H. F. Osborn, *From the Greeks to Darwin* (New York, 1899); cf. W. C. D. Dampier-Whetham, *A History of Science* (New York, 1931), pp. 290-295.

III. THE EVOLUTION OF THE THEORY OF EVOLUTION

Heraclitus believed that everything is "perpetually transposed into new shapes," but had no notion of the transformation process of life. Empedocles, poet, musician, embryologist, thought that life originates by spontaneous generation, all organisms arising out of fire, air, water, and earth through the combining force of love and the separating force of hate. Parts of bodies, such as eyes without sockets, arose first; but as love triumphed over hate, eyes sought sockets and arms sought shoulders, until animals, men, centaurs, chimeras arose. Some unnatural forms survived.[22]

Aristotle "was the first to conceive of a genetic series," of a "single chain of evolution from the polyps to man." He was able to distinguish five hundred species of mammals, birds, and fishes, and evidenced a considerable knowledge of marine life. He believed that nature "proceeds constantly by the aid of gradual transitions from the most imperfect to the most perfect." He differed from Darwin in believing in spontaneous generation and in holding that "nature does nothing without an aim"; but he held that "it is necessary (i.e. according to law) that germs should have been first produced, and not immediately animals; and that soft mass, which first subsisted, was the germ."[23]

The oft-quoted Lucretius maintained that "plants and trees arise directly out of the earth in the same manner that feathers and hair grow from the bodies of animals" having neither fallen from heaven nor arisen from the sea; that people sprang forth from mounds as earth children "nourished by springs of milk." He was no true evolutionist. His mechanistic philosophy of fortuitous combinations supported Empedocles rather than Aristotle.[24]

St. Augustine, influenced by his Manichean background, rejected special creation as a hypothesis and taught that, as the grain unfolds into a plant, the physical world and the various forms of life, after long delays, unfolded out of a divinely created potentiality. Hence, Osborn maintains that "if the orthodoxy of Augustine had remained the doctrine of the church the final establishment of evolution would have come far earlier than it did . . . and the bitter controversy over this truth of nature would never have arisen."[25]

[22] Osborn, *op cit.*, pp. 37-41.
[23] *Ibid.*, pp. 43-57.
[24] *Ibid.*, pp. 60-63.
[25] *Ibid.*, pp. 71-75.

Avicenna (980-1037), the Arabian, was a uniformitarian in his theory of the formation of mountains as caused by erosion, since he found the fossil remains of aquatic animals on their summits. Avempace (d. 1185) believed that strong ties bind men, animals, plants, and minerals "into a single and united whole."[26] Giordano Bruno (1548-1600) held that every species "becomes the starting point for the next." As in the expansion of the form of the embryo there is an unbroken continuity into species of man or beast. He thought that "through diverse causes, habit, orders, measures, and numbers of body and spirit, there are diverse temperaments and natures, different organs are produced, and different genera of things appear."[27]

Descartes (1596-1650), protecting himself, said he knew the world had been produced in no such way, but he had discovered principles by which its development could be more easily explained than by special creation. "All advances by degrees in nature and nothing by leaps. . . . Although there may exist in some other world species intermediate between man and the apes, nature had thought it best to remove them from us, in order to establish our superiority beyond question."[28]

Emanuel Kant (1724-1804) believed that all forms of life were derived from a common parent; that there is a "great family of creatures (for as a family we must conceive it, if the above-mentioned continuous and connected relationship has a real foundation)," which has "sprung from the immediate results" of Nature's "earliest revolutions."[29] Diderot (1713-1784) taught a speculative doctrine of the survival of the fittest. Bonnet (1720-1793) originated the term "evolution." Blind at the age of thirty-four, he turned to speculation uncontrolled by observation. Believing that the universe moves on by its own internal forces, he saw all varieties of organic life as preformed in the germs of the first beings. For him the appearance of higher forms was a simple unfolding of pre-existing germs.[30] Oken (1776-1851) wrote that "every organic thing has arisen out of slime, and is nothing but slime, in different forms. This primitive slime originated in the sea, from inorganic matter."[31]

Linnaeus (1707-1778) began with the doctrine of special creation of each species. He gave this hypothesis up in later life for the idea that "all the species of one genus constituted at first [that is, at creation] one

[26] *Ibid.*, pp. 75-78.
[27] *Ibid.*, pp. 81, 83.
[28] *Ibid.*, pp. 94-95.
[29] *Ibid.*, pp. 98-102.
[30] *Ibid.*, pp. 118-119.
[31] *Ibid.*, pp. 123-127.

species—they were subsequently multiplied by hybrid generation—by intercrossing with other species."[32] Buffon (1707-1778) was "surprized at the rapidity with which species vary, and the facility with which they lose their primitive characteristics in assuming new forms."[33]

Dr. Erasmus Darwin (1731-1802), the grandfather of Charles Darwin, wrote in verse *Botanic Gardens* and *Loves of the Plants* and, in 1788, published his *Zoonomia.* In *The Temple of Nature* he gave poetic emphasis to his theory of the origin of life:

> Hence without parents, by spontaneous birth,
> Rise the first specks of animated earth.
> Organic life beneath the shoreless waves
> Was born and nurs'd in ocean's pearly caves;
> First, forms minute, unseen by spheric glass,
> Move on the mud, or pierce the water's mass;
> These, as successive generations bloom,
> New powers acquire and larger limbs assume.
> Whence countless groups of vegetation spring,
> And breathing realms of fin and feet and wing.[34]

Dr. Darwin's doctrine of spontaneous generation did not extend to higher forms of life. He believed that modifications are not induced by the environment directly. These modifications "spring from within by the reactions of the organisms," which becomes adapted to new environments in various forms acquired by powers of development planted within the original organisms by the Creator. Yet the original "living filament" had to be "excited into action by certain kinds of stimulus" existing in the environment, rather than developing from "an inherent perfecting tendency."[35]

Lamarck (1744-1792) summed up the cultural mentality of the age into which he came, and his reaction to it as follows:

> In considering the natural order of animals, the very positive gradation which exists in their structure, organization . . . is very far removed from being a new truth, because the Greeks themselves fully perceived it; but they were unable to expose the principle and the proofs of this evolution, because they lacked the knowledge necessary to establish it. In consideration of this gradation of life, there are only two conclusions which face us as to its origin: *The conclusion adopted up to today:* Nature (or its Author) in creating animals has foreseen all possible sorts of circumstances in which they would be destined to live, and has given to each species a constant organization, as

[32] *Ibid.*, pp. 128-130.
[33] *Ibid.*, pp. 130-138.
[34] *Ibid.*, p. 140.
[35] *Ibid.*, p. 143.

well as a form determined and invariable in its parts, which forces each species to live in the places and climates where it is found, and there to preserve the habits which we know belongs to it. *My personal conclusion:* Nature, in producing successively all the species of animals, and commencing by the most imperfect or the most simple to conclude its labor in the most perfect, has gradually completed their organization; and of these animals, while spreading generally in all the habitable regions of the globe, each species has received, under the influence of environment which it has encountered, the habits which we recognize and the modification in its parts which observation reveals in it.[36]

Lamarck believed that these modifications and transformations take place in accordance with four laws: (1) life increases every organism up to a maximum limit of the whole and its parts; (2) new parts result from new needs or wants, continually felt by the organism; (3) organs develop in direct proportion to their employment and decay by lack of use; (4) traits acquired by use and disuse are inherited by succeeding generations, resulting in the rise of new species.[37]

Such is the line of succession in the hypothesis of evolution from the Greeks to the immediate predecessors of Darwin. What did Darwin add as his own individual contribution?

IV. THE CONTRIBUTION OF DARWIN TO THE THEORY OF EVOLUTION

We may follow Ginzburg as he interprets the situation out of which the hypothesis of Darwin emerged:

Darwin's theory of evolution was born on the voyage of the Beagle, although it was not crystallized into precise formulation until after his return to England. It formed itself in his mind as a fresh conception and not at all as an amendment or extension of older theories. Darwin always indignantly denied any debt to Lamarck or to any other of his predecessors, and psychologically this is quite correct. He had heard of Lamarck's theories; he had heard those of Erasmus Darwin quoted and discussed in his father's house, but none of these ideas had made any impression on him. In order to envisage a theory of evolution, two things were necessary: first, one had to bring one's self to doubt the fixity of species; and, second, one had to conceive a theory as to how the transmutation of species took place. Both of these experiences had to be entirely personal with Darwin. Even had he been intellectually more interested in biological theory in his Edinburg and Cambridge days, it is doubtful whether the theoretical discussions on the difficulties of separate creation would have struck any responsive chord in his mind. He had to see for himself. As to the Lamarckian theory of evolution, it always sounded to Darwin too idealistic and speculative. Although his own theory . . . incorporated im-

[36] *Ibid.*, pp. 163-164. [37] *Ibid.*, p. 166.

plicitly many Lamarckian factors, they were so transfigured by the general trend of the theory, which was characteristically personal, that Darwin never recognized any resemblances, let alone borrowings.[38]

However characteristically personal Darwin's discovery, it is highly obvious that he owed a great debt to the past; yet, the personal element was there; an element without which no discovery is ever made.

The first problem, concerning the fixity or the transmutability of species, he could not settle without first deciding just what constitutes a species—the manner in which species differ from sub-species.

> Certainly [he argued] no very clear line of demarcation has as yet been drawn between species and sub-species—that is, the forms which, in the opinions of some naturalist, come very near to, but do not quite arrive at the rank of species; or again between sub-species and well-marked varieties, or between lesser varieties and individual differences. These differences blend into each other by an insensible series; and a series impresses the mind with the idea of an actual passage.[39]

He further concluded that "The amount of difference considered necessary to give any two forms the rank of species cannot be defined."[40] He came to believe that species first existed as varieties, and held that varieties, arising through small biological variations, came to be widely enough separated to form species. The method of this divergence was by variation and *natural selection.*

Although it is often said that Darwin did for biology what Newton did for physics, that is, advanced a mechanical principle for evolution comparable to the universal law of gravitation in the physical realm, Darwin seemed inclined from the very first to place more stress on the dynamic nature of the organism than on the mechanism of natural selection. Thus the process of evolution had a double aspect, for one of which Darwin was never able to account; by his own acknowledgment, the most important one. Of these two aspects of the process, he writes:

> As far as I am able to judge after long attending to the subject, the conditions of life appear to act in two ways—directly on the whole organization or on certain parts alone, and indirectly by affecting the reproductive system. With respect to the direct action, we must bear in mind that, in every case, as Professor Weismann has lately insisted, and as I have incidentally shown in my work on variation under domestication, there are two factors; namely, the

[38] Benjamin Ginzburg, *op. cit.*, pp. 306-307.
[39] Charles Darwin, *Origin of Species*, "Harvard Classics," XI, 68.
[40] *Ibid.*, pp. 74-75.

nature of the organism and the nature of the conditions. The former seems to be much the more important; for nearly similar variations sometimes arise under, as far as we can judge, dissimilar conditions; and, on the other hand, dissimilar variations arise under conditions which appear to be nearly uniform.[41]

As to determining the forms variations will take, Darwin held that natural selection is no more important than the nature of a flame resulting from the ignition of a mass of combustible matter, and that natural selection does not induce variability, but only preserves such variations as arise "and are beneficial to the being under its conditions of life."[42] And by the time he wrote *Descent of Man,* after reading Nageli on plants and Broca on animals, Darwin had come to believe that perhaps he had attributed too much to the action of natural selection. As a result, he had altered the fifth edition of the *Origin* to "confine [his] remarks to adaptive changes of structure."[43] He had concluded that he "did not formerly consider sufficiently the existence of structures which, so far as we can at present judge, are neither beneficial nor injurious; and this I believe to be one of the greatest oversights as yet detected in my work."[44] As he said, however, that was a natural mistake, since the special creation theory he formerly held had stocked his mind with the idea that there were no useless structures.

Of course, Darwin was able to add the principle of correlated variations, of which only one has any survival value for the organism, while the others are preserved by the force of trait linkage. Such a case might exist in the relation of the color of the African Negro's skin, which has survival value under the actinic rays of the tropical sun, to other traits which have no such value. Yet he said that the "external characteristic differences between the races of man cannot be accounted for in a satisfactory manner" by natural selection, use or disuse of parts resulting in the inheritance of acquired traits, the principle of correlation, or the direct action of the conditions of life. He even went so far as to hold that probably none of the differences between the races of man is of any direct or special service to him.[45] One of the possible prejudices of Darwin is reflected in the fact, however, that he clearly believed in intellectual, moral, and social differences in races, which would constitute a definite

[41] *Ibid.*, p. 26.
[42] *Ibid.*, pp. 28-29.
[43] Charles Darwin, *Descent of Man* (2d ed.; London and New York, 1874 and 1901), chap. ii; cf. *Origin of Species,* pp. 222-223.
[44] *Descent of Man,* II, 88-89.
[45] *Ibid.*, chap. vii.

but insupportable racial psychology.[46] These differences, then, for Darwin would plainly have survival value.

At this point Darwin introduces the factor of the selection of attractive sex characteristics in prospective mates, such as are associated with color, hairiness, forms of features, and the like.[47] Certainly conscious in the human species, sex selection, varying with culturally defined standards, moves the Darwinian concept of evolution far from the mechanical principle supposedly comparable in biology with the law of gravitation in physics.

These considerations lead us to the conclusion so many students of biological evolution have reached; namely, that possibly no fact, no scientific theory, is better established than the evolutionary origin of the species; yet, the method by which the process has gone forward is one of the most uncertain hypotheses in scientific theory. This proposition can best be treated, however, with reference to objections to Darwinism after we have observed Darwin's method and have seen his mind at work in the development of his formulae.

V. IMAGINATION IN DARWIN'S METHOD

Few men were ever possessed of a richer or better controlled imagination. We have already seen how the hypothesis of natural selection came to him in a flash while reading Malthus' essay on population. It was twenty years after that, however, before he would publish his theory. All that time he continued observing and thinking, observing and thinking; trying hypothesis after hypothesis to explain his data, and letting one little fact, which a hypothesis could not explain, brush it aside. In the development of hypothesis he had a high respect for and made great use of imagination.

"The imagination," he said, "is one of the highest prerogatives of man. By this faculty he unites former images and ideas, independently of the will, and thus creates brilliant and novel results. . . ."[48]

> The value of the products of our imagination depends, of course, on the number, accuracy, and clearness of our impressions, on our judgment and taste in selecting or rejecting the involuntary combinations, and to a certain extent on our power of voluntarily combining them. . . .[49]

[46] *Ibid.*, p. 262, but compare his statement on this page with later comments on the psychological likenesses of all races in chap. vii.

[47] *Ibid.*, Parts II-III.

[48] *Ibid.*, chap. iii.

[49] *Loc. cit.*

No small part of Darwin's method was tireless work in increasing the number, accuracy, and clearness of his impressions by observation. Professor Osborn says that his power of observation was even more distinct than his rare reasoning powers. He followed every clue with dogged persistence and "noticed little things which escaped others; he always noted exceptions and at once jotted down facts opposed to his theories."[50] Darwin himself said that he considered himself "superior to the common run of men in noticing things which easily escape attention, and observing them carefully; my industry has been nearly as great as it could be in the observation and collection of facts."[51] And yet Darwin reiterated that "the mere collection of facts without some basis of theory for guidance and elucidation is foolish and profitless."[52] Darwin said, "I am a firm believer that without speculation there is no good and original observation." He said it had become a passion with him to "connect all such facts by some sort of hypothesis."[53]

The keenness of his insight into the significance of observable behaviors testifies to the value of his imagination in making it possible for him to be a great observer. As Dorsey points out:

> [This insight] as well as his method of approaching a problem, are beautifully illustrated in a letter to a friend in Brazil, who had declared that an old Negro woman, when expressing astonishment, closely resembled an astonished Cebus monkey. But Darwin asked: "Are you sure that the Cebus opened its mouth when astonished or listening? I ask because the Chimpanzee does not open its mouth when astonished or listening." And he asked his correspondent to remember that he was very anxious to know whether a monkey, screaming violently, partially or wholly closed its eyes.[54]

It is passages like this that make Dorsey think Darwin was a behaviorist. Let us follow his method throughout before we find comfort in it for sheer objectivism. Take, for instance, his pursuit of the hypothesis concerning circumstances favorable to the production of new forms of life through natural selection to demonstrate his method—an excellent example of non-objectivistic use of imagination and reason. He believed that great variability in species, isolation of the variants by groups in regions which were once thrown together in a very large area, and a

[50] H. F. Osborn, *Impressions of Great Naturalists*, p. 51, quoted in Gamaliel Bradford, *Darwin* (New York, 1926), p. 14.

[51] *Life and Letters*, I, 83.

[52] Gamaliel Bradford, *Darwin*, p. 47.

[53] Letter to Huxley, May 27, 1865, in *Life and Letters*, II, 19.

[54] G. A. Dorsey, *op. cit.*, p. 241.

breaking up of this continental area by geological changes to produce isolating barriers was the best explanation of the rise of new forms; and he wrote:

I conclude that for terrestrial productions, a large continental area, which has undergone many oscillations of level, will have been most favorable for the production of many new forms of life fitted to endure for a long time and to spread widely. Whilst the area existed as a continent, the inhabitants will have been numerous in individuals and kind, and will have been subject to severe competition. When converted by subsidence into large separate islands, there will still have existed many individuals of the same species on each island; intercrossing on the confines of the range of each species will have been checked. After physical changes of any kind, immigration will have been prevented, so that new places in the polity of each island will have had to be filled up by the modification of the old inhabitants, and time will have been allowed for the varieties in each to become well modified and perfected. When, by renewed elevation, the islands were reconverted into a continental area, there will again have been very severe competition. The most favored or improved varieties will have been enabled to spread; there will have been much extinction of the less improved forms, and the relative proportional numbers of the various inhabitants of the reunited continent will again have been changed; and there again will have been a fair field for natural selection to improve still further the inhabitants and thus to produce new species.[55]

Another example of his use of imagination and reason showing how far he was from limiting himself to the "bare-whatnesses" of observation, to a mere storing up of the number of sense impressions, is to be found in his hypothesis of extinction of various forms of life through natural selection, which he exemplifies as follows:

From these several considerations, I think it inevitably follows that, as new species in the course of time are formed through natural selection, others will become rarer and rarer and finally extinct. The forms which stand in closest competition with these undergoing modification and improvement will naturally suffer most; and we have seen in the chapter on the struggle for existence that it is the most closely-allied forms—varieties of the same species, and species of the same genus or of related genera,—which, for having nearly the same structure, constitution and habits, generally come into the severest competition with each other; consequently, each new variety or species, during the progress of its formation, will generally press hardest on its nearest kindred and tend to exterminate them. We see the same process of extermination amongst our domesticated productions, through the selection of improved forms by man. Many curious instances could be given showing how quickly new breeds of

[55] *Origin of Species*, "Harvard Classics," XI, 119.

cattle, sheep, or other animals and varieties of flowers take the place of older and inferior kinds. In Yorkshire, it is historically known that the ancient black cattle were displaced by the long horns, and that these were swept away by the short horns, as if by some murderous pestilence.[56]

Still another illustration of his method is found in his discussion of the relation of teleology and natural selection. He reflects:

It is scarcely possible to avoid comparing the eye with the telescope. We know that this instrument has been perfected by the long-continued efforts of the highest human intellects; and we naturally infer that the eye has been formed by a somewhat analogous process. But may not this inference be presumptuous? Have we any right to assume that the Creator works by intellectual powers like those of man? If we must compare the eye to an optical instrument, we ought in imagination to take a thick layer of transparent tissue, with spaces filled with fluid, and with a nerve sensitive to light beneath, and then suppose every part of this layer to be continually changing slowly in density, so as to separate into layers of different densities and thicknesses, placed at different distances from each other, and with the surfaces of each layer slowly changing in form. Further we must suppose that there is a power, represented by natural selection or the survival of the fittest, always intently watching each slight alteration in the transparent layers, and carefully preserving each which, under varied circumstances, in any way or in any degree, tends to produce a distincter image. We must suppose each new state of the instrument to be multiplied by the million; each to be preserved until a better one is produced, and then the old ones to be all destroyed. In living bodies, variation will cause the slight alterations, generation will multiply them almost infinitely, and natural selection will pick out with unerring skill each improvement. Let this process go on for millions of years; and during each year on millions of individuals of many kinds; and may we not believe that a living optical instrument might thus be formed as superior to one of glass as the works of the Creator are to those of man?[57]

Finally, we may again call attention to the fact that Darwin went far beyond the description of observed facts when he developed his hypothesis on the formation of coral reefs. Geologists had assumed up to his time that volcanoes had built up the steep and lofty cones which rose so abruptly from the ocean floor, but projected only slightly above the surface of the ocean as coral structures. They supposed that corals grew upon and capped the old, submerged volcanoes. Even Lyell thought the reefs arose that way.

But Darwin noticed something. It was a wee little bit of a something no bigger than a thousand other trifles like the wing-feathers of a condor. Philo-

[56] *Ibid.*, p. 121. [57] *Ibid.*, p. 193.

sophic minds would never have stooped to it. Geologists had never inquired about it. Darwin wondered how deep the coral animals could live. The answer to this query is now a classic proof of the blindness and futility of human reason when it is not based upon observation. Coral polyps cannot build at a depth greater than one hundred and fifty feet.[58]

But an expedition, financed by three governments, proved that, just as had been generally supposed by geologists, the atolls were solid coral for at least the eleven hundred feet penetrated by the drilling operations carried on.[59]

The active mind of Darwin, working on the subject, formed the hypothesis before he had an opportunity for the close-range observation, which Henshaw Ward rightly suggests will save us from "blindness and futility," that is, if we have eyes that know where and what to look for, that can see processes and relations as well as things.[60] He formed the hypothesis that the corals began to build on the ocean floor, that the ocean floor subsided, and that the corals kept building upward as the reef summits were about to be submerged. In the year 1841, five years after the *Beagle* had visited the Keeling and other coral islands, Darwin set out to test the hypothesis he had arrived at before that visit. Looking over maps of the world, he colored the regions of atolls dark blue, barrier reefs pale blue, fringing reefs red, and active volcanoes vermillion. He argued that atolls and barrier reefs should not appear near volcanoes, which are indicative of rising land, while fringing reefs, which may develop on stationary or rising land, might appear near volcanoes; hence the red for fringing reefs and the vermillion for volcanoes—kindred colors. As Ward suggests:

> We may imagine the absorbing interest with which he plotted the reds and blues, point by point as he gathered the bits of information, and had watched the areas grow on his map. Would there be cantankerous blue spots that would force themselves into the red area where they would spoil a theory? Would any red or vermillion dots have to be marked in a blue region? But, at the end of the year, he could exclaim, "I defy anyone to explain this map in any other manner."[61]

We may sum up Darwin's scientific activity, his method, with these words from Gamaliel Bradford, who writes:

> As to the activity of Darwin's mind there can be no question whatever. He not only saw, but he thought incessantly. If you compare the Beagle Jour-

[58] Henshaw Ward, *op. cit.*, p. 182.
[59] *Loc. cit.*
[60] *Ibid.*, pp. 20-40.
[61] *Ibid.*, pp. 213-214.

nal with Journal of Thoreau, you see at once how much more quick and ready the English naturalist is with speculation and conjecture. The smallest fact is apt to set him off on a train of theory, where Thoreau simply records, or possibly compares, and passes on. How significant is the brief comment of Asa Gray, in regard to some botanical point which as a specialist in that line he would have been the first to develop: That is real Darwin. I just wonder you and I never thought of it. But *he* did.[62]

VI. THE RECEPTION AND CRITICISM OF DARWIN'S THEORY

The reception accorded to Darwin's theory was a mixed one. A few scientists, especially Thomas Henry Huxley in England and Asa Gray in the United States, rallied about him. Lyell befriended Darwin with great caution. Hooker stood by him. Lord Alfred Russel Wallace advanced the same theory at approximately the same time.[63] Yet, as we have seen, a fact of this sort does not necessarily support the hypothesis of Ogburn that discoveries and inventions arise automatically out of sociological forces that surcharge the atmosphere.[64] As further evidence, we may cite: (1) Darwin's own testimony, and (2) the storm of opposition that his theory aroused. Darwin wrote:

> It has sometimes been said that the success of the "Origin" proved "that the subject was in the air," or "that men's minds were prepared for it." I do not think that this is strictly true, for I occasionally sounded not a few naturalists, and never happened to come across a single one who seemed to doubt about the permanence of species. . . . I tried once or twice to explain to able men what I meant by Natural Selection, but signally failed. What I believe was strictly true is that innumerable well-observed facts were stored in the minds of naturalists ready to take their proper places as soon as any theory which would receive them was sufficiently explained.[65]

Darwin met strong opposition even among notable scientists. The famous L. Agassiz of Harvard bitterly opposed him. Owen in England heaped abuse upon him. Many churchmen were very fierce in their condemnation. What two famous governors of the Old South said to each other is nothing compared to the exchange between the Bishop of Oxford and Huxley. The former asked the latter whether he "was related by his grandfather's or his grandmother's side to an ape." Huxley replied that he would not be ashamed to have an ape for a grand-

[62] Bradford, *op. cit.*, pp. 48-49.

[63] *Ibid.*, pp. 93-94; cf. Alfred Russel Wallace, *op. cit.*, which shows that Wallace was very generous toward Darwin; see also Bradford, pp. 95-96, and *Life and Letters*, II, 301.

[64] W. F. Ogburn, *Social Change* (New York, 1928), pp. 82-102.

[65] *Life and Letters*, p. 71.

parent, but that he would feel disgraced if he had an ancestor who, "not content with equivocal success in his own sphere of activity, plunges into scientific questions with which he has no real acquaintance, only to obscure them by an aimless rhetoric, and distract the attention of his hearers from the real point at issue by eloquent digressions, and skilled appeals to religious prejudice."[66]

We must agree with Ogburn, however, that an individual mind can never move on independently of the social process, as is evidenced by the fact that Darwin failed to make necessary distinctions between the biological and the social processes in the closing paragraph of his *Descent of Man*. Otherwise, he could never have arrived at the conclusions he formed with reference to the differences between Western Europeans and Fuegians. To opposition he protests:

> The main conclusions arrived at in this work, namely, that man is descended from some lowly organized form, will, I regret to think, be highly distasteful to many. But there can be hardly a doubt that we are descended from barbarians. The astonishment which I felt of first seeing a party of Fuegians on a wild and broken shore will never be forgotten by me, for the reflection at once rushes into my mind—such were our ancestors. These men were absolutely naked and bedaubed with paint, their long hair tangled, their mouth frothed with excitement, and their expression was wild, startled, and distrustful. They possessed hardly any arts, and like wild animals, lived on what they could catch: they had no government, and were merciless to everyone not of their own small tribe. He who has seen a savage in his native land will not feel much shame if forced to acknowledge that the blood of some more humble creature flows in his veins. For my own part, I would as soon be descended from that heroic little monkey who braved his dreaded enemy in order to save the life of his keeper, or from that old baboon, who, descending from the mountains, carried away in triumph his young comrade from a crowd of astonished dogs . . . as from a savage who delights to torture his enemies, offers up bloody sacrifices, practices infanticide without remorse, treats his wife like slaves, knows no decency, and is haunted by the grossest superstitions.[67]

Darwin did not know that the practice of infanticide was quite common in the England of a century before him, common and shameless, according to Ernest Caulfield; and he did not see that the difference between the England of his century and the Fuegians was a difference in culture rather than in race. But, if Darwin were among us today, no one would be quicker to acknowledge his mistakes, and perhaps no

[66] Dorsey, *op. cit.*, pp. 191-192. [67] Second ed.

one would be quicker to discover them. As Osborn says, "If he were living . . . he would be in the front line of inquiry, armed with matchless assemblage of fact, with experimental verification, and not least with incomparable candor and good will."[68] And every moment he would be turning upon nature the light of his imagination.

[68] H. F. Osborn, *Impressions of Great Naturalists*, p. 70, quoted in Bradford, *op. cit.*, p. 35.

CHAPTER IX

CREATIVE LEADERS IN THE SCIENCE OF SOCIETY: AUGUSTE COMTE AND A CENTURY OF HIS SUCCESSORS

"I am a firm believer that without speculation there is no good and original observation." —Charles Robert Darwin

"No language can be anything more than elliptical, requiring a leap of the imagination to understand its meaning in its relevance to immediate experience."—A. N. Whitehead

"We must learn to predict the past before we can predict the future—the sooner we stop traveling up the vista of time, the more serious will be the mistakes we fall into."—Auguste Comte

I. INTRODUCTORY

THE APPEARANCE of Darwin gave a great impetus to the development of the genetic approach in the sciences. Even the physical sciences did not escape his influence. W. Preyer, V. Meyer, W. Crooks, C. Wendt, and others[1] developed hypotheses on the origin of the elements and the struggle for existence of the molecules. C. Nageli, botanist of Munich, developed a hypothesis of the evolution of Mendeleeff's chemical group. J. Walther came forward with a theory of the survival of the fittest minerals in mountain formation. V. Meunier and F. Du Prel applied the idea to the origin of the solar system in the process of which the fitter survived.

In the field of language Schleicher (1821-1868), after reading Darwin, pronounced philology "a sort of natural history" of languages, as they arise "independently of the will of man . . . grow and develop according to natural laws . . . and finally decay and die out," hence, exhibiting "the characteristic features of a living organism."[2] Jaeger interested himself (1888) in the origins of language and put forth nature sounds and emotional cries as its sources.

In education, the recapitulation theory of Spencer, Preyer, and G.

[1] Emanuel Radl, *The History of Biological Theories*, trans. E. J. Hatfield (London, 1930), pp. 76-77.

[2] *Ibid.*, pp. 78-79.

Stanley Hall greatly affected the curriculum, which, it was thought, should parallel the racial recapitulation going on in the child. Furthermore, all subjects must be introduced genetically.

In ethics, Alexander Sutherland advanced a biological theory in a monumental work on *The Origin and Growth of the Moral Instinct*.[3] The survival of the fittest had scored again!

In history and sociology, Darwin exercised a profound influence. In fact, though not a sociologist, he shares with his notable contemporary, Herbert Spencer, the parentage of biological sociology. Not all the credit for the genetic approach, however, can be given to Darwin or Spencer. Auguste Comte came before them; and he, rather than Spencer, who began at the same time as Darwin, deserved to be known as the father of sociology.

Born in the year in which Malthus first published his famous *Essay* and dying two years before the appearance of the *Origin*, Comte was not overwhelmed by a cultural mentality which, as in the case of Spencer, aided in the growth of a false analogy. True enough, both men based sociology on biology; but Spencer never escaped from the field of biology, and never brought sociology to emerge as a science in its own right with methods or data specifically its own. Comte, while looking upon biology as prior to sociology, saw clearly that each succeeding science, and sociology more especially, contains elements and laws which transcend preceding levels.[4] Spencer did not make clear the difference between biological evolution and cultural evolution,[5] and few biological sociologists have been able to do it since. And to this day, all the statistical techniques of the biological-racial theorists,[6] for instance, have not saved them from errors of interpretation of the numerous data they have adduced to prove such propositions as the following:

Races, they hold, differ in reaction time, visual sensitivity, auditory sensitivity, the sense of smell, speed of performance, and intelligence as measured by tests, regardless of schooling, culture, social opportunity, or economic status. They differ in blood pressure, basal metabolism, vital capacity, speed of nerve conduction, and racial odors. They differ, says

[3] 2 vols.; New York, 1898.

[4] *Positive Philosophy*, Bk. VI, chap. iv, pp. 94-95.

[5] Evident in his *Principles of Sociology* (3 vols.; New York, 1880-97); cf. R. E. Park, "Sociology and the Social Mind," *American Journal of Sociology*, XXVII (1922), 1-21, for a contrast of Comte and Spencer.

[6] Otto Klineberg, *Race Differences* (New York, 1936).

the bioracialist in his extreme moments, so greatly that they must have had a multiple origin. With or without holding to polygenesis, in such moments he may claim that only Nordics are creative, or that the Mediterraneans have been the carriers of civilization while Nordics and Asiatics have been instrumental in its destruction. Or he may claim that the Civil War struck death to the Nordic hopes. He may teach that there is a correspondence between race and nation, race and language, race and evolutionary types, races and blood-types, endocrine types, constitutional types, personality types, occupational types, and what not. He often believes he has proved that intelligence varies with pigmentation, cranial capacity, high-low brows, brain-weight, and size of brain-area. He "proves" that introversion-extroversion varies with racial stock; that there are racial differences in will-temperament, impulsiveness, morality, emotionality, submissiveness, social participation, and musical ability. He is sure that degree of race mixture is correlated with disharmony of type, level of intelligence, vigor, and achievement.[7] He is positive that race is correlated with the crime rate, type of crime, mental abnormality, types of insanity, and so on.[8] And, indeed, it must always be remembered that the more capable stocks migrate first! Lapouge even went so far as to hold that the Nordic is by nature a Protestant and an individualist, while the Alpine is inherently a Roman Catholic, who prefers the protection of the state.[9] And all these errors are the result of considering sociology as but a neglected corner of biology.

As a victim of the errors of the biological tradition, Karl Pearson, who, by the way, was more of a social Darwinist with respect to the conflict of the races than with respect to class conflict,[10] was unable to separate social science from biology. This lack of discrimination is manifested in his works on *The Ethic of Free Thought* and *National Life from the Standpoint of Science*.[11]

[7] One of the most uncritical authors in racial theory outside of Nazi Germany in recent years is Louis A. Boettiger, *Fundamentals of Sociology* (New York, 1938), chap. xvi.

[8] *Ibid.*, throughout, and Sorokin, *Contemporary Sociological Theories*, chap. v; cf. E. A. Hooton, *Crime and the Man* (New York, 1939).

[9] Vacher de Lapouge, quoted in Sorokin, *op. cit.*, pp. 234-235.

[10] Karl Pearson, *The Function of Science*, pp. 9-12, quoted in Sorokin, *op. cit.*, p. 261: "The ladder" between the classes "should not be too easy."

[11] *The Ethic of Free Thought* (London and New York, 1901); *National Life from the Standpoint of Science* (London and New York, 1900); Benjamin Kidd, *The Science of Power* (New York and London, 1918), calls the social-Darwinism of Galton and Pearson "the pagan ethic"; see esp. chap. iii.

Francis Galton, well fed, and with an excellent opportunity from youth, as an unadulterated social-Darwinist, believed the upper classes superior in intelligence.[12] And those who worry over the depletion of the supposedly superior old American stock are followers of Galton and of social-Darwinism.[13] They would probably be unable to sympathize with the viewpoint that equalitarians may lament the passing of natural selection with at least as much logic as the exponents of eugenics. No matter how untrue romantic concepts of the "free savage" of Rousseau might be, and no matter how false the idea of natural equality, it is likely that "natural selection" would give many of the supposed "unfit" a better chance to survive than they have in present-day social selection, which is supposed to favor the inferior as against the superior stocks. For, regardless of differences in native ability, a theoretical state of nature would come nearer giving all an equal opportunity to exercise whatever ability they possess than do the present circumstances.[14] The old writer who sang:

> When Adam delved and Eve span,
> Who was then the gentleman?

might well have put in the refrain:

> When nature showed all men one face,
> Were "gentlemen" fittest of their race?

The influence of the biological tradition still further shows itself in the treatment accorded to Comte and three hundred other eminent men in the Stanford University *Genetic Studies of Genius,* edited by Professor L. M. Terman, who lends the weight of his name.[15] It ought to be hard to understand how these studies could repeat the mistakes of Galton so long ago demolished by Alfred Odin, Charles Horton Cooley,[16] and Lester F. Ward.[17] Yet, in this book, there is little to indicate that the

[12] Francis Galton, *Hereditary Genius* (London, 1892), pp. 1, 12, 30, 31.

[13] As an example, see N. D. M. Hirsch, *Genius and Creative Intelligence,* p. 71.

[14] For example, see Karl de Schweinitz, "Sickness as a Factor in Poverty," *Annual Proceedings National Conference on Social Work* (Chapel Hill, 1919), p. 161; cf. J. H. S. Bossard, *Social Change and Social Problems* (New York, 1934), p. 311.

[15] 3 vols.; Palo Alto, 1925, 1926, 1930, Vol. II, chap. iii; note that the concept of "historiometry" is far removed from the concept of culture.

[16] Lester F. Ward, *Applied Sociology* (Boston, 1906), Part II; Cooley and Odin are quoted frequently in this section.

[17] *Loc. cit.;* cf. L. F. Ward, *Psychic Factors of Civilization* (Boston, 1906), chaps. xxvii-xxxi.

writers were conscious of the implications of either the concept of culture or of the social process as something that could be distinguished from the biological process. They found, out of two hundred and eighty-two men in "Group A," that 52.5 per cent had professional or noble parents; 13.1 per cent had parents who were skilled workmen and lower-class businessmen; and the remainder came from the ranks of the unskilled and semiskilled.[18] But they did not consider how the bases of prestige shift in the social process, or by virtue of cultural change. They did not take sufficient recognition of the greater social opportunity of the favored classes in their interpretations, and they nowhere considered the relation of the eminent men studied to the stream of culture flowing in the direction of specialization and creativity in the particular activity which made them eminent. This failure demonstrates again the fallacy of confusing the biological with the cultural process.

We must, however, acknowledge the full force of the claim of the writers that a large majority of these eminent men were of superior intelligence. There is no more point in sheer cultural than in sheer biological determinism. Therefore, inexact as the statistics may be in *Genetic Studies of Genius,* we may well believe that Comte and Spencer, the latter of whom the writers did not even name, although they did include George Washington and General Sherman, were both far above the average in native ability. Below is their sketch of Comte's life, indicating, as the writers believe, his qualities as a genius.

II. A BIOPSYCHOLOGICAL ESTIMATE OF COMTE

Auguste Comte (1798-1857)
A Celebrated French Philosopher, Founder of Positivism
. . . I.Q. 150 . . . 170

I. *Family standing.* Comte's father was a district tax receiver. No other record is preserved of the ancestry or family.

II. *Development to age seventeen.*
1. Interests (none other than scholastic are reported).
2. Education. Auguste's devout Catholic mother directed his early studies. At nine he was sent to the local college, and at fifteen he passed the examination for entrance to the Paris Polytechnic.
3. School standing and progress. On entering the college Auguste was at once distinguished for his intelligence and industry. He was tractable with the professors, who were "fond and proud of their clever pupil," and he did such brilliant work that he was given first place in the

[18] Catherine Morris Cox and others, *op. cit.,* Vol. II, chap. iii.

application for membership to the Polytechnic School in Paris. At the Polytechnic, Comte was distinguished as a student of intellectual power; his ability was recognized, not only by the professors, but by the students as well. At the end of the first year, he was ranked ninth in his class, the ranking depending partly on deportment, in which he stood low with all except the head professors.

4. Friends and associates. (No specific record.)
5. Reading. By the time he was sixteen or eighteen, Comte had read through the numerous important philosophical works of France, England, and Germany.
6. Production and achievement. After passing the entrance examination for the Paris school at fifteen, one year in advance of the age at which entrance was allowed, Comte was appointed by the faculty of his own school to occupy the interval of waiting for his sixteenth birthday by giving mathematics courses in their institution.
7. Evidences of precocity. "He was a nervous child, impatient, very intelligent, very eager for instruction, with an extraordinarily precocious mind. . . ."

III. *Development from seventeen to twenty-six.* From sixteen to eighteen Comte studied at the Polytechnic School in Paris. A great worker, he was devoted to reading and delighted especially in philosophical writings. When he was eighteen, a mutinous demonstration on the part of the pupils against one of the masters [in which Comte took part] broke up the school. [Remaining in Paris,] Comte . . . a year later, chancing to come into contact with Saint-Simon, . . . fell under the spell of the great theorist, and for six years he was proud to sign himself "pupil of Saint-Simon." At the age of twenty-four Comte was so completely in harmony with his master's views that he was able to prepare the philosophical introduction to the *Contrat Social.* This was not his first attempt at essay writing, for he had already published two essays. . . . The preface to the *Contrat Social* shows that Comte had already developed a definite philosophical scheme, and that he had outlined plans for his life's work. In bringing out the essay at a later date, Saint-Simon accompanied it with a patronizing notice, and when Comte [at the age of twenty-six] objected to publication at this time, a breach occurred, personal dislike matured into a quarrel, and the two philosophers separated.[10]

This bitterness was so great that Comte gave Saint-Simon credit for no contribution whatsoever to the development of the positive philosophy. He maintained that Montesquieu and Condorcet had made the only positive contributions in political science worth mentioning, and that they came too soon in the historical process to conceive of the method as a

[10] *Ibid.*, II, 571-573.

whole.[20] Passing up his later contacts with Madame de Vaux as having no bearing upon positivism in its grand conception, and taking the sketch above as indicative of the more personal of the influences playing upon him, because of limitations of space, we may narrow down the questions to be presented and be content when we ask: (1) What contributions came to him out of the social process, the importance of which he recognized in estimating the advances made by Montesquieu and Condorcet? (2) What indicated his originality? and (3) What has been the contribution to sociology of the Comtean philosophy?

III. THE PREDECESSORS AND THE ORIGINALITY OF COMTE

A. His Predecessors

Saint-Simon (b. 1760), as indicated above, was idolized by Comte for nearly a decade before the two men quarreled. But, before meeting him, Comte had read all the important philosophical writings of Europe. And it was these writings which brought the data for the Comtean synthesis to the door of his mind. In the ample room of his thought, he had communed with Descartes, Locke, Hume, Fourier, Turgot, Condorcet, and Benjamin Franklin, as well as Saint-Simon. This fact needs equal emphasis with the geneticist's stress on the high I.Q., which, though a prerequisite to concern with these philosophers, does not account for the peculiarities of his orientation. In addition to the influence of philosophical writings, the man cannot be understood without reference to the total social situation in the pre-revolutionary, the revolutionary, and the post-revolutionary epoch. Especially is this true of his treatment of the relationship of the positive philosophy to the problem of social reorganization confronting Europe; for he held that the theological mentality had been the organizing principle in the Middle Ages, that the negative nature of the metaphysical mode of thought had been the ferment of the Revolution and that the negative mood of the latter would be incapable of reorganizing the society of the post-revolutionary age. Such reorganization could only be effected by the positive mode as the road to the necessary consensus.

Comte freely acknowledged his indebtedness to his predecessors, except in the case of Saint-Simon. Condorcet, whom he termed his "spiritual father," had traced the development of the human mind through ten

[20] *Positive Philosophy*, Bk. VI, chap. ii.

successive epochs, with the optimism to believe that during the tenth epoch, "the future progress of mankind" will bring a "perfectibility of man . . . absolutely indefinite" with "no other limit than the duration of the globe on which nature has placed us."[21] Condorcet also held that every past period influences every period which follows it, and all the past epochs of human achievement will influence the future. And Comte's ability to trace the roots of the idea of cultural development, sought after by Condorcet, although nobody in his time used the term, is seen in his reference to "the immortal aphorism" of Pascal to the effect that, "The entire succession of men, through the ages, must be regarded as one man, always living and incessantly learning."[22] Comte also stressed the fact that Condorcet did not take proper account of laws that govern social phenomena; that it is necessary to have a knowledge of these laws in order to predict the future; in order to be able to see what will happen when man attempts the exercise of control. All progress must depend upon the rational use of such knowledge. In fact, the revolutionary thinkers were all wrong in believing they could bring about a radical revision of the social order in a single generation; for, in addition to man's conscious attempts to control the situation, there are always the factors of physical nature, of race, and of human consensus, or the lack of it. The latter must wait upon the establishment of the positive method in social science.[23]

In his concept of progress, Condorcet was not entirely free from confusing the biological and the cultural processes, since he put considerable stress on the inheritance of acquired traits.[24] Yet, he was possibly freer from such confusion than Saint-Simon, who "conceived social and moral phenomena as based on physiological causes and conditions, and instead of creating a separate classification for social science, regarded it as an aspect of the science of physiology just as Comte later classified psychology as a department of biology."[25]

[21] J. P. Lichtenberger, *Development of Social Theory* (New York, 1925), pp. 238-240; cf. C. A. Ellwood, *History of Social Philosophy* (New York, 1938), pp. 220-229.

[22] *Positive Philosophy*, Bk. VI, chap. ii.

[23] *Ibid.*, Bk. VI, chaps. ii-iii.

[24] C. A. Ellwood, *op. cit.*, pp. 226-229.

[25] Lichtenberger, *op. cit.*, p. 242; I cannot agree with Lester F. Ward, in *Psychic Factors* . . ., when he says (p. 122) that Comte, as well as Spencer, "made the mistake of supposing that the social forces were vital instead of psychic factors." Cf. Ellwood, *op. cit.*, pp. 393-395.

B. His Originality and His Contribution

At this point, then, it may be observed that Comte begins to be original. His outline of the development of the human mind, sketched in an earlier chapter, may owe much to Condorcet; and his view of the effects of anarchy in the prevailing philosophies, resulting in the lack of what Sorokin calls a "cultural mentality" and in the corresponding presence of chaos, may be a reverberation of Saint-Simon. But his view of the autonomy of sociology is a mere reflection of the thinking of none of his predecessors; hence, the emphasis in this chapter on the impetus given to the new science in one direction by Darwin and Spencer, from which not all have recovered, and the impetus given it toward a true orientation by Comte.

Further evidence of his originality is to be seen in his logical consistency, his power to link the ideas of his predecessors together with his own ideas in a philosophy "admirably consistent throughout." And Levy-Bruhl affirms, perhaps with a touch of patriotic pride, that Comte brought to France something that had not been seen for a long time: "an original system of philosophy, borrowing its principles neither from the English nor the Germans."[26]

Equally important in determining the degree of the originality of Comte are the relations he bears to the present-day schools of sociology. What Socrates was to Plato, Aristippus, and Antisthenes, each of whom supposed he was teaching the true version of his master, Comte has been to many who came after him; even to those who scoff at him as a "mere philosopher." For, in him we find, on the one hand, the roots of objectivism and, on the other, protests against the applicability of direct experimentation as conceived in physical science to social science investigations. In him we discover at once a respect for mathematics and an opposition to statistical atomism. He supports specialization, but sees, at the same time, that specialization results in anarchy without the work of synthesis. He holds to a unity of scientific method, yet emphasizes the fact that, though the chemist moves from parts to wholes, the social scientist must move from wholes to parts. He derides imagination, uncontrolled, yet he makes imagination his greatest tool, and says that the positive philosophy is imagination's "vastest and richest field."[27] He dethrones theological modes of thought but sets up a religion of humanity and establishes a

[26] L. Levy-Bruhl, *History of Modern Philosophy in France* (Chicago, 1924), p. 259.
[27] *Discourse on the Positive Spirit*, pp. 24-25.

priesthood. His objectivity ends in a subjective synthesis; and yet, all the while, the man is strangely consistent as he turns first one facet, then another, of his personality.

Passing over the reactions to Comte in his times, we may say that conflicting views of Comte, today, come out of looking steadily (or is it carelessly?) at only one of his facets. With all due respect for Professor Small, it is still possible that his own German sociological antecedents kept him from being fully aware of the influence of Comte on American sociology,[28] which was acknowledged by Lester F. Ward,[29] is very clear in the writings of Cooley and of Ellwood, and has been manifested indirectly by many who, presumably, know little of Comte.

Without attempting the difficult task of settling the debate between Ward and Small on the apostolic, sociological succession, it seems best in a brief space to consider various sociological problems of today in the light of the positive philosophy; to project, without the intricate tracing of conceptual ancestries, the concepts of the latter upon those of the former. We might begin by outlining some of the leading concepts of modern sociology, which have been preceded by closely kindred concepts in Comte.

Note, for instance, the emphasis of up-to-date social pathologists on the concepts of social organization, social disorganization, personal demoralization, and social reorganization;[30] then begin to look for their sources, and you will find, at least, their parallels firmly rooted in the writings of Comte. Social order as related to progress, the social process, social interaction, association, co-operation, co-ordination, subordination, differentiation—"separations of social functions" and "co-operation of endeavors"; community—"union" as opposed to association; social continuity, social forces, social crises, social evolution, social change, cultural complexes and types, adumbrated, at least, in "filiations and interconnections" as the "master thought of social statics"; the wish for new experience as a social force, social control, the total situation, and the Gestalt concept of group life: all these concepts are rooted there, regardless of what other soils have sent up kindred stems. Then, there are the older concepts of pure and

[28] Albion W. Small, *The Origins of Sociology* (Chicago, 1924), pp. 315-317.

[29] *Dynamic Sociology*, I, 1, 85, cited in Small, *op. cit.*, pp. 315-317. See how much of Ward's terminology in *Pure Sociology* (Boston, 1903) is Comtean.

[30] Stuart Queen and Delbert Mann, *Social Pathology* (New York, 1925); Mabel Elliott and F. E. Merrill, *Social Disorganization* (New York, 1934); S. A. Queen, W. B. Bodenhafer, and E. B. Harper, *Social Organization and Disorganization* (New York, 1935).

applied sociology; of social statics and dynamics; the concept of uniform cultural evolution, with a critical attitude toward it, except as the process constitutes stages of learning; and a clear vision of the values of, yet of the dangers inherent in, the comparative method in sociology.[31]

Hence, it may be inferred that there is ample justification for setting Comte forth as the creator of many concepts of great use to the sociologist today, however many changes have been made since Comte in terminology. Not the least contribution has been along the lines in which he has been oftenest misunderstood: namely, in the matter of sociological method. If social scientists of today had profited more fully by the Comtean contribution, none of them would have overstressed the value of statistics, been guilty of sociological atomism, or gone to seed in so-called objectivism; but all would have realized the necessity of determining social facts in the light of the total situation, discovered the value of viewing society in the "axis of time" as well as in the "axis of space," recognized the value of synthesis, and insisted upon the development of a pure sociology that would be truly significant when applied. Let us take these Comtean concepts, project them upon, and see what they suggest about: (1) the still-picture descriptions of statistics and formalism, (2) the feverish urge toward objectivism, (3) the vast bodies of atomistic materials brought together by the comparative method, (4) recent movements in the direction of the recognition of "filiations and interconnections" in society in the relations of parts to wholes, and (5) the problem of the future of mankind. Upon the first three topics we shall project the Comtean concepts of social space and social time, or social statics and dynamics. In the fourth, we shall see how the concepts named are related to the modern concepts of institutional configurations, ecological distribution, natural area, culture area, and so on; and in the last we shall apply the concept of the subjective synthesis to the problem of social progress and the future of man.

IV. THE COMTEAN CONCEPTS OF SPACE, TIME, FILIATION, AND THE SUBJECTIVE SYNTHESIS PROJECTED UPON THE VIEWS OF HIS SUCCESSORS

A. Space, Time, and Statistics

Comte held that the sociologist, like every other scientist, must have a foundation education in mathematics in order to "form the habit of

[31] *Positive Philosophy*, Bk. VI, chaps. iii-vi.

rational and decisive argumentation"; in order to "learn to fulfill the logical conditions of all positive speculation."[32] Speculation, however, is not what every statistician will allow. Of course, Comte supported the use of statistics by sociologists; but he saw that the application of a "mathematical law to social problems," if "inadmissible in biology . . . must be yet more decisively so here." Sociology can no more be considered a branch of mathematics than biology "by suppressing the function of historical analysis."[33] But the error of the mathematicians is, because of the abstract nature of their science, greater in this respect than that of the biologists.

Comte's objections to considering sociology as a branch of mathematics was a natural consequence of his stress upon the historical "method." Franz Oppenheimer affirmed:

> Synthesis of space and time axes was Comte's great object; he consigned it to all his successors, and most of them took over the inheritance with this charge. We are not here speaking of the representatives of that tendency which already seems outworn, which came from Simmel, but was finally given up by him as well, which conceives sociology as a purely formal science, analogous to logic and grammar. . . . Sociology as the *theoretical science of the social process* as such and as a whole, cannot think of renouncing its right to treat the chief and most interesting part of this process, social progress (process). It cannot content itself with investigating its subject only in the cross section, so to say, in the axis of space; in order to get closer to its goal it must be allowed to investigate it in the longitudinal section, in the axis of time, in order to be able to find the synthesis of these two considerations, the law of the whole.[34]

B. Space, Time, and Formalism

To use Oppenheimer's terms along with the Comtean concepts of statics and dynamics, among those who view society in the "axis of space" is the school of the formalists.

Leopold von Wiese,[35] who passes Comte by, is a member of the formalist school which, Oppenheimer says, Simmel gave up. It may readily be seen that he discerns society not as *consisting of individuals and of groups in conscious and emotional interaction, with culture as a product of human social interaction and as a factor in present and future inter-*

[32] *Ibid.*, Bk. VI, chap. iv. [33] *Loc. cit.*

[34] Franz Oppenheimer, "History and Sociology," in Ogburn and Goldenweiser, *op. cit.*, p. 223.

[35] Howard Becker, *Systematic Sociology, on the Basis of the Beziehungslehre and Gebildelehre (by Leopold von Wiese)*, adapted and amplified by Howard Becker (New York, 1932).

action but as patterns. It is thus that he misses the contribution that might be given him by anthropology and history. His imagination is of the abstract sort and his whole system is a mental construct which prompts admiration. Yet he fails to see how the patterns of the present have emerged out of the patterns of the past. Examine for a moment Becker's "frame of reference for the systematics of action patterns," the sections on "Advance," "Adjustment," and "Accordance" under "Processes of Association," and it becomes apparent that his action patterns are nude when unclothed by culture. Advance is made in transitions from contacts by accepting, acclaiming, accompanying, escorting, acknowledging, confessing, adoring, worshiping, alluring, amusing, entertaining, applauding, voicing approval, assenting, becoming familiar, being spokesman for, advocating the cause of another, cheering, comforting, consoling, condescending, confiding in, consulting, dedicating, enticing, giving reciprocally, communing, interpellating, pardoning, petitioning, requesting, rewarding, seconding, thanking, toasting, and serenading, and the like. Adjustment takes place through believing in someone, coming to terms, covenanting, giving credit, imitating, inculcating, ingratiating, palliating, and so on. Accordance involves behaving so as to evoke a like response, complaisance, deferring to another's judgment, forming a friendship, establishing a home, interceding, sharing another's burdens, treating, endorsing, and so forth.[36]

Since culture furnishes the patterns by which all these actions are performed, which make them acceptable as "applauding," "voicing approval," "pardoning," "petitioning," and so on—yes, even the patterns which constitute the acts of "advance" rather than conflict—one may wonder, not with Theodore Abel, whether a cultural sociology is possible, but whether without culture there can be any sociology.

C. A. Ellwood makes this fact very clear. He shows that "the most elementary forms of human association are modified by culture," and holds with Duprat that even these "most elementary forms . . . vary in different civilizations." Then, he affirms, "all measurements of social movements and tendencies are bound therefore to vary with time and place."[37]

Culture develops, moreover, in the axis of time as "mental patterns,

[36] *Ibid.*, pp. 718-720.

[37] C. A. Ellwood, "Culture as an Elementary Factor in Human Social Life," *Social Science*, X (1935), 313-318.

socially acquired and socially transmitted by the use of symbols."[38] The two aspects of culture are custom and tradition, custom being the objective aspect and tradition the subjective. Custom is social habit, overt and observable; tradition is social beliefs, ideas, sentiments, values, and standards, inner and transmissible by the meanings given symbols in the experience of the group.[39]

The very essence of culture is acquired meaning, which is communicated from person to person symbolically. Meaning, in our sense of the word, is the interpretation given an object or event by the organism and the effect of that interpretation on the organism. There is, therefore, no stimulus existing as an invariable fact for all organisms, especially human. What Koffka has called the "geographical environment" is not the same stimulus to two apes in the same cage.[40] In the case of human beings, original nature, individual experience, and culture interact in the development of personality as the subject-object organization of the socius, and make the object as variable as the subject, not as a thing-in-itself, nor as a sheer geographical or physical fact, but as a stimulus to the subject.

It should not be forgotten, however, that it is a dynamic-organism-in-interaction-with-its-environment that makes the meaning of events both possible and variable. Schiller suggests that meaning is not an inherent property of objects and not a static relation between them; nor is it a static relation between the subject and the object, "but essentially an *activity* or *attitude* taken up towards objects by a subject and energetically projected into them like an *a* particle, until, they, too, grow active and begin to radiate with meaning. Here, if anywhere, would seem to lie a clue to the mystery of meaning."[41]

Since the meaning objects have is not inherent, but is "projected into them," meaning is a product of history, of the past experience the human organism has had with the objects as they are culturally defined. And since formalism fails to "travel up the vista of time," it cannot adequately understand the origin and the presence of the meanings which cause

[38] C. A. Ellwood, *Cultural Evolution*, p. 4.

[39] F. J. Teggart, *Theory of History* (New Haven, 1925), uses the terms "tradition" and "custom" in this sense; E. A. Ross, *Social Psychology* (New York, 1908), p. 196, made this distinction in the terms.

[40] Kurt Koffka, *Principles of Gestalt Psychology* (New York, 1935), pp. 31-42.

[41] F. C. S. Schiller, Bertrand Russell, and H. H. Joachim, "The Meaning of Meaning," *Mind*, XIX (1920), 390.

human beings as individuals to make the very approaches and withdrawals with which it is most concerned.

C. Space, Time, and Objectivism

If meaning, as developing in the axis of time, is neglected by the school of formalism, it has also been sadly overlooked, in its subjective and attitudinal aspects, as described above, by those who have joined in the feverish urge toward objectivism.[42] The term *objectivism,* in its present use, should not be confused with objectivity. For the former implies a subjective lack of self-criticism in some who, for instance, at least used to, insist on pure external behaviorism as *the* method of social investigation, while the latter is the attitude of every investigator who is conscious and critical of his own assumptions as a factor, not only in his methods of observation and classification of what he considers his pertinent facts, but also in his final conclusions. The urge toward objectivism moves the investigator to overlook the inner nature of meaning as a social fact and to fasten his eyes upon observable behaviors without reference to their concomitants in the above-all-other-response of consciousness and of feeling.[43] This, however, is an inadequate method of observation; for

> Meaning forms the true "theatre" of mental operations, the stage on which the various sorts of "objects" make their brief appearances and play their little parts. . . . The view of meaning I have advocated may be summed up in the phrase that *meaning is essentially personal* . . . that it is relative to the *whole personality* and is not purely intellectual.[44]

Since acquired meaning is the essence of nonmaterial culture, and, as such, is not purely intellectual but relative to the whole personality, we can clearly understand why it is necessary to *feel* a group's experience as well as to *see* its culture objectively. As a matter of fact, we have already seen that dramatic insight is essential to objectivity, and we have discussed at length the principle of sympathetic observation. What remains to be done is to examine the lack of use or the misuse of this important principle, which may be restated here in the words of J. E. Boodin:

> To understand the conduct of human beings, we must understand their participation, consciously or unconsciously, in group beliefs and ideals, with

[42] Talcott Parsons, *The Structure of Social Action* (New York, 1937), pp. 581-586.
[43] Cf. *ibid.*, about intuitionism, pp. 587-591.
[44] Schiller, *op. cit.*, p. 390.

the control that these exercise over them. . . . The important part of conduct to us is conduct which has reference, consciously or unconsciously, to social meanings. . . . In short, human beings are not physical automata, but social beings. Their conduct can be understood only as we understand their interstimulation within a network of social relations, within a cumulative tradition.[45]

In keeping with this principle, Thomas Mott Osborne had himself locked in Auburn prison for a week in pursuit of his study of criminology,[46] and Nels Anderson played for a time the part of a hobo before attempting to write his book on *The Hobo*.[47] Each man wished to get an inside view of the life of the group under observation through participation in its activities.[48]

[45] J. E. Boodin, "The Law of Social Participation," *American Journal of Sociology*, XXVII (1921), 25-53; cf. Edgar T. Thompson, "The Grammar of Society," *Sociology and Social Research*, XIX (1935), 510-511.

[46] Thomas Mott Osborne, *Within Prison Walls* (New York, 1914).

[47] Chicago, 1923.

[48] Spending time in prison, however, without a sentence against the observer still requires imagination for true social participation. Thomas Mott Osborne was able to get into the minds of the prisoners, however, as can be seen in his successful career as a warden at Auburn and at Sing Sing. But some of those who try to understand the minds of others through becoming observing participants very clearly misunderstand the principle. Schanck and Schanck furnish us with an example of how not to use the participant method. In their study of "Elm Hollow," they actually joined a Baptist church and a Methodist church in the same town, interviewed the members, and participated in their rituals and ceremonies. Chapin believes that they "gained more insight into the significant attitudes of church members" than can be gained by "ordinary pen and paper questionnaires." (See F. S. Chapin, *Contemporary American Institutions*, New York, 1935, pp. 367-371, concerning the report of Richard L. Schanck and Mrs. R. L. Schanck on "A Study of a Community and Its Groups and Institutions Conceived as Behaviors of Individuals," *Psychological Monographs*, XLIII, 1932, No. 195.) No doubt he is right. Yet they used very defective face-to-face methods. They have reported their results, giving a series of graphic tables dealing with attitudes toward cardplaying, the nature of baptism, of the Lord's Supper, the ownership of property by the church, and the theater. To illustrate their results, it may be observed that they asked in their conversations three questions in order to detect the difference in public and private attitudes; that is, three questions concerning each rite of the church; for instance: (1) Is baptism real? (2) Is it symbolic? and (3) Is it superstitious? They found that 58.83 per cent of the Methodists believed that baptism is real, 37.25 per cent that it is symbolic, and 3.92 per cent that it is superstitious (use of the term). This, however, was the distribution of their public attitudes. Their private attitudes showed 41.18 per cent, 39.92 per cent, and 19.60 per cent took the attitudes named, respectively.

Overlooking the exactitude of two-place decimals in reporting subjective tests of the attitudes of fifty-one people, one may notice that, at best, the questions were stated crudely. Who has a very definite idea as to what it might mean to say that baptism is *real*? The only definite word used is *symbolic*. Did the people whom they interviewed, as they thought, intimately, know what was meant? Did Schanck and Schanck know what the answers meant? Furthermore, how well can students of institutions who join two churches for the purpose of studying them really participate in the attitudes of either? Were they really in sympathy with the groups they joined as were Osborne and Malinow-

Those who do not or have not recognized this principle since Comte have been, or are, less alert than he was. For Comte was no stranger to this idea of social participation, and neither was he a stranger to the force of the cumulative tradition. For him, "the consensus of the social organism extends to Time as well as Space. Hence the two distinct aspects of social sympathy: the feeling of Solidarity, or union with the Present; and of Continuity, or union with the Past."[49] Comte knew that data would never have the same meaning to the theological, metaphysical, and positive states of mind; and he saw that lack of consensus is a barrier to joint participation, that it stood in the way of solidarity and union, and that the "systematics of action" would have to wait upon the rise of the "systematics" of thought and feeling.[50] Therefore, his apparent objectivism, as defined above, and his disrespect for introspection as a psychological method did not exclude him from an appreciation of social participation as a method of social understanding—a position, at least, implicit in his work. For he held that unity depends upon scientific social understanding; and however much promoted by observation, comparison, and the statistical treatment of data, such understanding, in turn, increases with a growing subjective synthesis which can never proceed without the aid of the imagination, not as a slave of the affective nature turned toward supernatural and arbitrary wills, but as a servant of sympathy turned toward participation in the life of humanity.[51] Thus it seems that Floyd House stopped too short in holding that the consensus of Comte was only a matter of functional interdependence in a structural solidarity.[52]

When we turn to the successors of Comte on the Continent and in England and study them in the light of their attitude toward the principle of social sympathy, of imaginal participation in a consensus that has developed "within a cumulative tradition," as compared with sheer objectivism in scientific method, we find some sharp contrasts prevailing. Some of those supposedly least influenced by Comte are more like him than some of those said to be his followers.

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ski? If not, they really did not participate in their life at all. Again, the presupposition they began with, that institutions are behaviors of individuals, would make a difference in their way of looking at institutional symbols of meaning, which owe much of their significance to *joint participation*. The Lord's Supper, for example, involves not simply a relation of an individual to a ceremony taken as an objective fact but a social sentiment which could never be understood by those who join the parish simply to *see* it.

[49] A. Comte, *A General View of Positivism*, trans. J. H. Bridges (London, 1865), pp. 385-386. [50] *Ibid.*, pp. 22-23. [51] *Ibid.*, pp. 16-24.

[52] Floyd N. House, *Development of Sociology* (New York, 1936), p. 117.

F. S. Marvin[53] and Talcott Parsons[54] think that Durkheim belonged in the line of the positivist succession.[55] No doubt he was greatly influenced by Comte. Yet, while Durkheim placed great stress on the *collective consciousness,* he emphasized the externality of social facts, such as traditions, customs, and institutions, to the minds of individuals to a much greater extent than is indicated in the organicism or consensus of Comte, and apparently supported an objectivism which, in his interpretations of his social facts, he clearly did not follow.[56] Otherwise, how could he have claimed any insight into the meaning to the Australians of their famous corroborees, or ever have seen so clearly, though necessarily imaginatively, into the minds of suicides?[57]

If we turn back to Germany, we find it is generally believed that Comte had no influence on Werner Sombart and Max Weber. Comte and Weber are not named together; but von Wiese and Weber are, the former putting his approval on the latter but not on Sombart.[58] We may, however, without claiming that the "father of sociology" contributed anything to either Sombart or Weber, find a greater kinship between the positions of Comte and Weber than between von Wiese and Weber. For, while von Wiese approves of Weber's view of sociology as an "understanding" science, he makes too little use of the historical process as an aid to understanding. Weber does not neglect the historical process in the development of meanings in a given culture. Furthermore, in the light of what has already been said about Comte's "subjective synthesis" and his idea of the "systematics" of thought, feeling, and action in social wholes; in view of his concept of "social sympathy," as compared with the ideas expressed in the quotation here given from Weber, we may see how the latter's *Verstehen* compares with the former's "systematics" and "consensus." Weber differentiates "action" and "social action" in the following clear-cut definition:

"Action" . . . denotes that type of human conduct (overt or covert, passive or active) to which a *meaning* is assigned by the acting person or persons. "Social" action differs from this in that it is carried out, according to the intention of the acting person or persons, with reference to the behavior of

[53] *Comte* (London, 1930), p. 180. [54] *Op. cit.,* p. 307.
[55] C. A. Ellwood, *History of Social Philosophy,* pp. 426-434.
[56] E. Durkheim, *Le Suicide* (Paris, 1897), Bk. I, chap. iii.
[57] Talcott Parsons, *op. cit.,* pp. 348-349.
[58] Becker (von Wiese), *op. cit.,* pp. 57-61, and Theodore Abel, *Systematic Sociology in Germany* (New York, 1929), p. 159.

others and is oriented toward the behavior of those others throughout its course.[59]

Then, with this view of social action, Weber logically holds that the method of social understanding is through experiencing, by insight into the minds of those acting, what their purposes are and what their actions mean to them. He illustrates it by showing how we may watch a man chopping wood as an overt fact without getting any knowledge whatsoever of what the action means to the man, which is after all really *what he is doing;* that is, working, or taking exercise, rather than merely swinging an axe.[60] Hence, we understand the behavior of a population in the light of its meaning system; for social action is "such action as, according to its subjective meaning to the actor or actors, involves the attitudes and actions of others. . . ." Sociology, then, is "a science which attempts the interpretive understanding . . . of social action in order thereby to arrive at a causal explanation of its course and effects."[61]

Weber used both a vast amount of data and of imagination, as also did Comte. He was not, as in the case of von Wiese, a sociological nominalist, concerned with the approaches of dyads and triads, and of larger populations in accordance with abstract formal principles, but rather with the manner in which a population is caught up into cultural mentality constituted by ruling motives, interests, ideas, values—a meaningful system which controls and explains its social action.[62] It was thus that he could envision capitalism and protestantism in the same configuration.[63]

Weber refuted objectivism as being particularistic and individualistic and as depending too much upon "raw experience." At the same time, he objected to intuitionism as depending too greatly upon the immediacy of experience without the aid of concepts in interpretation of that experience.[64] Sombart, for example, made too little use of interpretive concepts.[65] Yet, Sombart helps us to understand Weber. Park has interpreted the former for us in terms of observing a chess game in the light of a knowledge of the purposes of the players as follows:

To understand a thing in this sense (of what is in the mind of the players) is to take account of the reason, the purpose, and in general, the function which

[59] Quoted in Becker (von Wiese), *op. cit.*, pp. 56-57.

[60] Talcott Parsons, *op. cit.*, p. 636; for further illustrations, see L. Levy-Bruhl, *How Natives Think*, p. 116.

[61] Talcott Parsons, *op. cit.*, p. 641.

[62] *Ibid.*, chap. xvi.

[63] *Ibid.*, chap. xiv.

[64] *Ibid.*, pp. 586-589.

[65] *Loc. cit.*

it performs in the cultural complex. We understand a language, not by descriptions of the parts of speech of which it is composed, nor of the rules of syntax which describe how words are put together, but by interpreting these formal symbols in terms of the sentiments and ideas they are intended to express.[66]

Not only does Sombart help us to understand Weber, but he helps us, as his position is stated by Park, further to clarify our position with reference to the Comtean consensus, which represents no more a mechanical or structural configuration than that described in the quotation.

As we turn our attention away from Germany to England, it may seem a still farther cry from Comte to Spencer's fellow countryman, Malinowski; but, though the two Englishmen, the one in the last, and the latter in this century, have made much more use of anthropological materials than Comte, Malinowski is much closer to Comte than he is to Spencer in sociological methodology. Let us illustrate:

When Malinowski first went to the Trobriand Islands, he was unable to speak to the natives except in pidgin English; but he wanted to get into their group life; accordingly, he moved his tent into a native village. At first, he busied himself with the observation of externalities, "took a village census, wrote down genealogies, drew up plans, and collected the terms of kinship." But all this, he saw, "remained dead material, which led no further into the understanding of real native mentality or behavior," since it was difficult to get "a good native interpretation of these items," or "get what could be called the hang of tribal life." The medium of pidgin English was entirely inadequate to convey to him their ideas of religion, magic, spirits, and sorcery. The information he received from the whites already living there was the most discouraging thing that he encountered. "Here were men who had lived for years in the place with constant opportunities of observing and communicating with them, and who yet hardly knew one thing about them really well," being "full of the biased . . . opinions inevitable in the average practical man, whether administrator, missionary, or trader." He was convinced that he could not get at the "imponderabilia of actual life" as reflected in the emotional responses of the people without becoming a group participant and, so far as possible, playing a member role, "with an effort at penetrating the

[66] R. E. Park, review of *Die drei Nationalökonomien*, in *American Journal of Sociology*, XXXVI (1931), 1073-1075.

mental attitude expressed in details, such as are usually catalogued by the untrained observer."[67]

Malinowski specifically states that the scientist must attempt to record the spirit, the subjective states, the "typical ways of thinking and feeling, corresponding to the institutions and culture of a given community, and the experiences of individuals as members of their groups."

Malinowski writes in another place:

> Imagine yourself suddenly transported to a coral atoll in the Pacific, sitting in a circle of natives and listening to their conversation. Let us assume further that there is an ideal interpreter at hand, who, as far as possible, can convey the meaning of each utterance, word for word, so that the listener is in possession of all the linguistic data available. Would that make you understand the conversation or a single utterance? Certainly not.
>
> Let us have a look at such a text. . . .[68]

Then Malinowski adduces a statement in native, giving under each word its nearest English equivalent. The statement, as literally translated, runs: "We run frontwood ourselves; we paddle in place; we turn we see companion; he runs rear-wood behind their sea-arm Pilolu." In the language of the Trobrianders this statement is ambiguous. But, when translated into English, it means nothing to the listener who speaks that language. It is a story about a canoe race told by the winners. Frontwood, for example, means the canoe ahead, and "we paddle in place" carries the meaning of being near the goal, the village on the shore, while "behind their sea-arm Pilolu" means that the competitors were so far behind that the winners were near the goal before the losers had hardly started.

It takes close observation and *it takes sympathetic observation* to get into the *context of situation,* to feel the quality of a people's "ego-object stresses," and to catch meaning on the elusive wing. That is why the man of research has to be assimilated into his environment as does an immigrant before he can understand it; why, while he needs to be conscious of his cultural medium, he must not be out of sympathy with it; and why we may agree with Comte that pure objectivity (objectivism

[67] Bronislaw Malinowski, *Argonauts of the Western Pacific* (London, 1922), pp. 5, 18-19.

[68] B. Malinowski, "The Problem of Meaning in Primitive Language," in C. K Ogden and I. A. Richards, *The Meaning of Meaning* (New York, 1927), p. 300.

in the present language) is as near to blindness as sheer subjectivity is to madness.[69]

In summing up the weakness of formalism and objectivism, it may be said that the inner nature of meaning is missed by the formalist who does not understand it as the essence of culture, developing in time, and by the objectivist who does not recognize it as the "theater" on whose stage is taking place all present interactions; and these facts account for no small amount of barrenness in the researches conducted in comparative psychology. The comparison of man with other animals psychologically is a fruitful process, if the psychologist is conscious of the differential factor of culture. If he is not, the results are fruitless if not actually misleading. Formalism was, no doubt, the only viewpoint, and objectivism the only method of a former colleague of the writer, who produced his doctoral dissertation on *The Love Life of the Fruitfly*, after studying, painstakingly, for many months the approaches of the male and female in mating behavior. He did his best to get "into the context of the situation," but did not realize that the historical process has done something for man that it probably has never done for the fruitfly (in fact, he seemed to doubt it had): namely, to modify the forms of approach and withdrawal in courtship; and this so long after Comte, who wrote: "No examination of facts can explain our existing state to us, if we have not ascertained by historical study, the value of the elements at work"; and again: "We must learn to predict the past before we can learn to predict the future—the sooner we stop traveling up the vista of time, the more serious will be the mistakes we fall into."[70]

D. Space, Time, and Comparative Atomism

This leads us to the third non-Comtean social scientist—the student who is given to comparative atomism. If he is an ethicist, such a student finds the "moral man," and writes with no sense of the individual history of peoples developing in isolation from others, no perspective or vision. If, without giving up the atomistic comparisons of the "ethical man" here and the "ethical man" there, the economic man of this region and that, and the "biohom" as such everywhere, he begins to read history by the comparative method, he runs the risk of becoming lost in a perfect maze of abstracted data to which he can give no logical order in

[69] C. A. Ellwood, *Methods in Sociology*, p. 31.
[70] *Positive Philosophy*, Bk. VI, chap. iii.

keeping with reality. Again, he can get at reality only by sympathetic imagination through knowledge of the group's culture as he moves in the "context of the situation." This is the only way he can understand what Comte called the "filiation" or the "interconnections" of a society. Although he recommended the comparative method as valuable, when wisely used, he warned that it can give us no idea of *the order of succession of states in a society,*[71] a fact which Spencer is not the only one since Comte to overlook. The "father of sociology" further warned that there is nothing in the comparative method to disclose what a given behavior means in the light of the total situation (not his terms, of course); for, without using such terms as *cultural complex* and *functional relations,* he advanced similar ideas under the concepts of *interconnection* and *filiation,* and it seems that he understood the principle of cultural configuration.[72] Certainly he was as much interested in the filiation of society as in the filiation of the sciences; for the latter was only a means to the former as an end.

In so far as Comte held to the concept of uniformly successive states of social development, except as necessary stages of learning, he was, as everyone now recognizes, in error; but, with all his friendliness to the comparative method, he knew enough about the nature of social development to escape from atomism in any form, and to indicate that he saw how such a fallacy might march hand in hand with a method, the comparative, valuable when rightly used, but often abused, so that it isolates elements from various cultures to support a hypothesis which may apply in only one culture.

Since Comte, Edward Westermarck, who has made much use of the comparative method, has clearly recognized its deficiencies and has begun to call for more monographs on cultures taken as wholes. In *The Origin and Development of Moral Ideas,*[73] he tells us that he spent four years in Morocco in preparation to write the treatise, and then he proceeds apologetically to use the comparative method for the rest, saying, "Even the certainty of the statements on which conclusions are based is not always beyond a doubt."[74] Earlier, Lester F. Ward had asked how much of Spencer's data are factual; how much "descriptive sociology can be depended on?" He said that he read Vaccaro's *Bases sociologiques du droit et de l'état* and found it a work of great value; but when, toward

[71] *Loc. cit.*
[72] *Loc. cit.*
[73] London, 1906, 1912, 1924, pp. 1-3.
[74] *Loc. cit.*

the close, the author wrote a chapter on democracy in America, nearly every statement in it was false in fact and a large part of the chapter stupid and ridiculous. "After reading this," he remarks, "my faith in all accounts of foreign countries of which I have no personal knowledge was completely shaken."[75]

The readiness with which we have outlined, by this same method of comparison, apparently parallel or contrasting ideas in Comte and later writers may, of course, impress some as being somewhat lacking in caution. It is easily possible to read more into Comtean concepts, such as filiation and interconnection, than they meant to Comte in the light of the filiations of his own system. The suggestions made, however, are strongly indicated in the writings of Comte, for whom no more is claimed than that he sowed fruitful seed, which has been diligently cultivated in other minds, and the fruits of which have encouraged other plantings. It is easy to question the statement of Floyd House that the influence of Comte, outside of France, is hard specifically to trace.[76] Yet, one of the aims of this chapter is a general projection of Comte upon his successors rather than an intricate tracing of specific influences.

E. Social Space, Filiation, and Institutional Configuration

The Comtean concepts have been criticized, expanded, enriched, abused, and often misunderstood. Even so penetrating a writer as Talcott Parsons has accused the "father of sociology" of mechanism;[77] and others who may or may not misunderstand him have made no use of him. J. F. Brown, who could have found deep roots of "field theory" in Comte for his approach to the social order via the Gestalt theory, nowhere mentions the latter's name.[78]

Some of the root principles advanced by Comte that laid the foundation for Gestalt social theory are the concepts of filiation and interconnection, considered by Comte as the key to an understanding of social space or social statics; for the whole Gestalt approach is built upon the Comtean principle that the social scientist, more especially, must proceed from wholes to parts. In fact, this wholes-parts principle has been a powerful factor in framing more recent sociological method. The above reference to Edward Westermarck is an example. In recent years,

[75] L. F. Ward, "Contemporary Sociology," *American Journal of Sociology*, VII (1902), 644.

[76] F. N. House, *op. cit.*, p. 119; cf. H. A. Phelps, *Principles and Laws of Sociology* (New York, 1936), p. 3.

[77] Talcott Parsons, *op. cit.*, p. 293.

[78] J. F. Brown, *Psychology of the Social Order* (New York, 1934).

Florian Znaniecki has produced one of the best books published on sociological method in which he emphasizes and expands the idea.[70] Margaret Mead,[80] Ruth Benedict,[81] Lynd and Lynd,[82] and others have joined Malinowski in the study of filiations or configurations of systems of group culture, and students of institutions are putting forth the concept of institutional filiation or configuration. And there is much in Chapin's outline of institutional configurations that suggests likeness to the ideas of filiation and interconnection in Comte. Chapin, in discussing the characteristics of institutional configurations, writes:

1. We may say that the structure of a social institution consists in the combination of certain related type-parts into a configuration possessing the properties of relative rigidity and relative persistence of form, and tending to function as a unit on a field of contemporary culture.

2. Four main type-parts which combine to produce the configuration or cultural concretion known as the social institution are: . . . First, common reciprocating attitudes of individuals and their conventionalized behavior patterns. . . . Second, cultural objects of symbolic value; that is, objects charged with emotional and sentimental meaning to which human behavior has been conditioned. . . . Third, cultural objects possessing utilitarian value; that is, material objects that satisfy creature wants (property). . . . Fourth, oral or written specifications of the patterns of interrelationship among attitudes, symbols, culture traits, and utilitarian traits (the code).[83]

Chapin has done some valuable work in his study of institutions. He has recognized the unseen as well as the seen, the latent as well as the open aspects of institutional life; and he has sought ways in which the social scientist might *see* these unseen aspects quantitatively. His method has been to find the inner meaning of the type-parts of institutional configurations by careful quantification of their objective aspects.[84]

[70] *The Method of Sociology* (New York, 1934).

[80] Margaret Mead, *Sex and Temperament in Three Primitive Societies* (New York, 1935).

[81] Ruth Benedict, *Patterns of Culture* (Boston, 1934).

[82] R. S. Lynd and H. M. Lynd, *Middletown* (New York, 1929); cf. *Middletown in Transition* (New York, 1937).

[83] F. S. Chapin, *Contemporary American Institutions* (New York, 1935), chap. xvii, esp. p. 359.

[84] As already observed in Chapter VI, the more one thinks about attempts at social measurement, the more he may come to believe that the best quantification that can be attained is only in the form of indicia of reality, not measurements of social reality itself; that is not measurable by any sort of instrument. Indicia are valuable and deserve wide use; but real indices have no more value than creative thinking gives them in their basic construction, their application, and their interpretation. Chapin says, e.g., that the ratio of young people to older people in a church is an index of youthful vigor and buoyant

But the significance of interpretation and of meaning and the difficulty of making "that pale thought of yours" into "this warm thought of mine" even in science is seen in the fact that Chapin reminds us that his outline of the institutional configuration has been quoted by Reuter and Runner, Hiller, Wallis and Willey, J. K. Folsom, Allport, and Hartman, but he thinks that it has been understood only by the latter two men. "It is evident" that the others did not understand that the "implicit purpose of the definition," Chapin complains, was "to afford the opportunity for quantitative definition. . . . *Implications are not likely to be grasped when they run counter to the prevailing approach.*"[85]

Chapin is right. There is a lack among scientists of the Comtean subjective synthesis; and the italics have been added to the quotation to call attention to the fact that Chapin's "language symbols" were completely open to the sociologists who quoted him, but that their inner meanings could be grasped only by those who shared membership in the complainant's quantitative church of science holding certain attitudes toward the study of institutions. Scientists misunderstand one another through lack of sympathetic observation of one another's real attitudes in the same way that social scientists, say ethnologists, fail in research because they really do not participate in the social life they would study. Scientists do not always understand other scientists' folkways, even when the others are at work in the same field.

If there is so much that is implicit about definitions, there certainly is so much implicit about institutions that their totality will never be explicitly quantified. And this fact is recognized by Znaniecki, who says some pertinent things about the method of the ethnologist in the study of savage institutions which become appropriate here as supplementary, one might say, corrective to the quantitative method of Chapin in his

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activity, and that youthful vigor and social maturity are two attributes of "wholeness" in a church. But is this all there is to wholeness? Finding indices for social maturity and youthful vigor, he correlated these with indices of social deterioration and of parish compactness as a cultural ground from whose field the church configuration emerged. The index of social deterioration was reached by rates of juvenile delinquency, infant mortality, family relief, transiency, tuberculosis, suicide, industrialization, and economic status in various geographical districts in Minneapolis. The compactness of the church parish was measured by the distance its membership lived from it in concentric zones—a certain percentage living within a one-mile circle being taken as the index of compactness.

This information is all very valuable in helping a church to plan its community program, but it gives us very little knowledge of the "unseen" aspects of social institutions.

[85] *Loc. cit.*

study of institutional configurations. As the ethnologist approaches a savage tribe, he cannot at first reconstruct by observation the cultural systems of music, ritual, etc.

> He knows that these are cultural values from his own past experience, but he is also aware that they are different from the values he knows, that he does not understand their meaning and cannot reconstruct the systems to which they belong. If he should have failed to become aware of this at once, he may be unpleasantly forced to realize it by having his own way actively interfered with by the tribe.[86]

Suppose that we try applying the quantitative method to totemism in its objective aspects in order statistically to see the unseen. How can totemism be quantified? Does it represent a mystical identification? A theory of ancestry? A symbolism of group unity and values? Edward Sapir declares:

> The central importance of totemism lies not so much in a mystic identification of the individual or group with an animal, a plant, or other classes, of objects held in religious regard . . . as in the clustering of all kinds of values that pertain to a social unit around a concrete symbol. This symbol becomes surcharged with emotional significance . . . because of all the vital experiences, inherited and personal, that it stands for. . . . Totemism is [a] . . . psychological phenomenon . . . [like] . . . [the] Christian . . . cross.
>
> . . . A Haida Indian . . . [is always] involved in an explicit or implicit reference to the Killer-Whale crest . . . when he is born, comes of age, is married, gives feasts, takes a name, decorates his belongings, or dies.[87]

We can see all these ceremonies; but looking upon them as objective facts will give us no more insight into their meaning than we have into the meaning of a custom whose tradition seems to have been lost out of our experience—the throwing of rice, for example, at a wedding. If we see someone throwing rice, all it suggests to us is that someone has just been married. We appreciate that much as the only filiation, the only meaning the act has; but it has no such relation to "vital experiences, inherited and personal," and surcharged with emotional significance as have totemistic practices whose significance rests in a deep and abiding tradition.

Only one other illustration of *experiencing* institutions in their *context of situation* may find space; namely, the study of art and the value of understanding a people's art to understand the people.

[86] Znaniecki, *op. cit.*, p. 175.

[87] "Anthropology and Sociology," in Ogburn and Goldenweiser, *op. cit.*, p. 111.

Read Bain stresses the value of studying art to understand a cultural system. He suggests that poetry expresses the poet's own time, yet with a tendency to lag behind its age; that Sandburg, for instance, will be understood only as people catch up with his culture. He says that some poets look back, others look forward. But poetry is democratic.

> Hence, poetry which is really read and recited by a group is the finest kind of research material for the sociologist interested in attitudes, sentiments, valuations, which are really alive in the minds of people. If poetry is read and repeated, it is the real stuff of men's mental and emotional makeup. . . . Scientific research into our poetry may tell us some surprising things.[88]

The poetry itself is the best source of understanding an age, not the criticisms of literary men. Since the major poets appeal only to a few, more can be learned by asking the people what poems, rhymes, and proverbs they know. The more democratic the poet, the more fruitful is his study for understanding his age. For example, there is François Villon. But the scientist who is interested in the present will find Kipling, Service, Wilcox, Guest, Riley, Lindsay, Montague, Kiser, Sophie Loeb more fruitful to study than Masefield, Eliot, Amy Lowell, Noyes, Sandburg, Bridges, Robinson, Frost, and Millay. Racial and national attitudes may be discovered by the poetry a group reads. The scientist may also find valuable the reactions of the poet. Especially fruitful may be the study of the poetry of family relations, democracy, and labor. Jerome Dowd has made good use of poetry in the study of the American Negro.[89]

Bain has advanced perhaps as excellent an index of sentiments and attitudes as any. It should not be forgotten, however, that it is easier to reconstruct the cultural system represented by art if one already has some experience which will enable the reader to move imaginatively from his own to the other cultural system. Observe how this fact is expressed by Edwin L. Sabin in "The Navajos":

> Out in the land of little rain;
> Of cactus rift and canyon plain;
> An Indian woman, short and swart,
> This blanket wove with patient art;
> Before her loom by patterns queer,
> She stolidly a story told
> A legend of her people, old.

[88] *Sociology and Social Research*, XII (1928), 40.
[89] Jerome Dowd, *The Negro in American Life* (New York, 1926), chap. xxxix.

With thread on thread and line on line,
She wrought each curious design,
The symbol of the day and night,
Of desert dark and mountain height,
Of journey long and storm beset,
Of village passed and dangers met,
Of wind and season cold and heat,
Of famine harsh and plenty sweet.

Now in this pale-faced home it lies,
Neath careless, unsuspecting eyes,
Which never read the tale that runs
A course of ancient mystic suns,
To us 'tis simply many-hued,
Of figures barbarous and rude;
Appeals in vain its pictured lore;
An Indian blanket—nothing more.[90]

F. Space, Time, and Human Ecology

Far more Comtean than the atomists whom we have discussed and the geographical determinists, whom we shall not discuss, are those who pass up geographical determinism of the Buckle-Huntington-Semple type to develop the concepts of ecology, natural, and cultural areas. R. D. McKenzie possessed something of Comte's "architectonic vision" as he described the spatial distribution of the great or world society as being determined by leading, dominating centers around which the satellite centers revolve. In the old indigenous world, there were a multitude of little societies which did not specialize, except in a limited way; but, "the development of communication is rapidly transforming the world" from the small unspecialized and unrelated groups into a world in which dominating centers control many specialized and functionally related centers, all of which touch each other through the center of dominance. Urban centers in the Occident and the Orient tap the resources of new frontiers until the earth is becoming an organic whole, in which "centers and routes are gaining precedence over boundaries and political areas as points of interest in spatial distribution."[91]

[90] Edwin L. Sabin, in "The Navajos" (by Oscar Lipp), quoted in E. S. Bogardus, *The Fundamentals of Social Psychology* (New York, 1931), pp. 201-202.

[91] "The Concept of Dominance and World Organization," *American Journal of Sociology*, XXXIII (1927), 28-42. The best ecologists are men like O. D. Von Engeln, *Inheriting the Earth* (New York, 1922); Isaiah Bowman, *The New World* (New York, 1928); R. Mukerjee, *Regional Sociology* (New York, 1926); and P. W. Bryan, *Man's Adaptation of Nature* (London, 1933).

Yet, spatial distribution is not the main fact about human societies, important as it is. The main fact is the complex of attitudes and relationships among human groups in pursuit of culturally defined values; and the main course of distinctively human evolution has been cultural rather than ecological. Thus, the pressing need for realization of the economic unity of the earth waits upon a change in rampant present-day nationalistic values in which boundaries and political units still take precedence, if not a growing precedence, over "centers and routes." Furthermore, the development of communication has been more a psychological and a socioculturally determined fact than a matter of ecology, a fact which McKenzie came, probably, to recognize. At the same time, we may appreciate the descriptive value of the ecological approach, and commend its time perspective, recognized in terms of natural history and ecological succession.

G. Social Time and Natural History

The term "natural history" has been used in "various and sundry ways." It seems in general to be preferred by those who stress the unconscious aspects of social change and minimize its conscious aspects. However, all that is generally meant by the natural history of a community, an area, an institution, or a "delinquent career" is that it follows certain type-cycles, the type being thought of as only an ideal construct from which all individuals vary more or less. The natural history concept suffers from two limitations. The first one is that it does not carry with it the distinction between the natural history of a tuft of grass and of a social group, while a term is needed that will indicate the really significant distinctions. The likenesses may be important, but they are not so important as the differences. The second limitation of the concept is a corollary of the first: its failure to give ready recognition to the part played in the long stretches of cultural development by the creativity of human intelligence. The inevitability of the process obtrudes itself in some minds. One writer, speaking of cross-sectional studies, which, however grand the manner, give no concept of process, expresses in the same sentence "the notion that communities and institutions have their own inevitable forms of natural history."[92]

This may be true of primary groups, let us say, as groups which

[92] C. A. Dawson, "The Sources and Methods of Human Ecology," *The Fields and Methods of Sociology*, p. 287.

must perish with their members; but what is inevitable in the long stretches of culture? Granting it was inevitable that the mining processes, carried forward on a large scale, should originate in culture, what made it inevitable? What made the plantation inevitable? The textile industry? The abolition of cannibalism? Just how could a natural history treat the abolition of cannibalism as inevitable? What is more nearly natural in the process than the intervention of the human intelligence?

A party of sportsmen went hunting in 1798 in the woods of Caune in the department of Aveyron in southern France. They chanced upon a "wolf-boy." His finding influenced the direction of development of the first schools for the feeble-minded in Massachusetts fifty years later; for Jean Itard's attempts to educate the "wolf-boy" led Edward Seguin, who had profited by the former's experiences, to turn to the attempt to educate the feeble-minded. Because of revolutionary disturbances in France in 1848, Seguin came to the United States and became a leader in the development of the early American institutions for the feeble-minded. What was the inevitable in the process of establishing schools for the feeble-minded? There have been other "wolf-boys" in history, and there have been feeble-minded persons in every society in all times; but institutions for them did not begin to have a "natural history" until within the last century.[93]

Once institutions and patterns have originated, they do tend to follow certain type-patterns—mining towns and cultures, Middletowns, Main Streets, Lumbertowns, plantations, fishing ports, agricultural villages, "Gold Coasts," slums, natural areas in cities in general, gangdoms, and so on—each type of institution tending to be a species of its own. In this way it has natural history, always within the framework of the larger culture, which makes its existence possible. It is possible, however, to read the process farther back than forward.

R. E. Park has defined a natural area in a city as an area that is not planned, not designed, but which city plans probably need to control and correct; areas that have grown up out of "tendencies inherent in the situation"; slums, ghettoes, immigrant colonies, bohemias, hobohemias, residential areas, the loop, areas of light and heavy industry, and the like. Some of the areas are functionally related, and some are not. These

[93] J. H. S. Bossard, *Social Change and Social Problems*, pp. 503-505.

areas always grow up in every urban community; and Park recognizes their kinship to the anthropologists' cultural area.[94] Is it not possible, however, that while such areas always have grown up in cities so far in history, we may make enough progress in city planning that we can avoid such "natural areas" in some future time? Can they not become planned functional areas?

The term "cultural area" suggests the term "cultural process" and, at the same time, suggests the interplay of emotion and intelligence in goal attainment, which, often enough, has its unplanned and nonpurposive by-products, which have often been described under the title of "natural history."

"Natural history" has been a useful concept, and it is still useful in sociology; but it cannot explain the origin and disappearance of types. "Wheat belts, for example, may expand through the *invention* of new types of wheat which require a shorter growing season or they may contract under the stress of the *market conditions*."[95] One may wonder whether the ecological succession in the Puget Sound region[96] follows a certain type of development in a large number of regions or whether we need to supplement "type" theory in process classification with the idea of configurated processes which do not require typologies to carry the concept of lawfulness. Process-configuration includes the purposive and the nonpurposive, the rational and the nonrational, the intelligent and the mechanical, all in the same total process of becoming; and the part played by the purposive and the factor of intelligence must not be minimized. Adjustment situations are shot through with cultural patterns. These cultural patterns

> may be either invented by the individual mind or acquired by communication and imitation from other individuals or groups. When a pattern of a certain sort is launched, it is usually carried through until it is relatively perfected. Then some innovation in a new direction produces a pattern of another sort, which is developed in its turn.[97]

Lester F. Ward's "sympodial evolution," which F. S. Chapin's statistical data on inventions support,[98] and the essence of which Professor Ell-

[94] "Sociology," in Wilson Gee, *op. cit.*, pp. 28-29; cf. Park, "Urbanization as Measured by Newspaper Circulation," *American Journal of Sociology*, XXXV (1929), 61.

[95] C. A. Dawson, *op. cit.*, p. 302. Italics are mine.

[96] R. D. McKenzie, *Publications of the American Sociological Society*, XXVII (1929), 60-80.

[97] C. A. Ellwood, *Cultural Evolution*, p. 51.

[98] Lester F. Ward, *Pure Sociology*, chap. v; cf. C. A. Ellwood, *op. cit.*, p. 51; F. S.

wood has stated in the quotation just above, is a concept that provides an understanding of the way in which types begin and end in a way which supplements the explanation by "natural history," especially when the latter term is narrowly defined.

H. Space, Time, and the Culture Area

The last way to be considered of viewing society in the axis of space is represented by the concept of the culture area, which, as said above, seems to be more suggestive of the cultural process than the term "natural area" and to imply more of the interplay of emotion and intelligence in the creation of the total environment within the area. According to a committee of the Social Science Research Council, a culture area may be defined "as a region having certain definite characteristics or elements of culture—both material and non-material—which distinguish it from other areas."[99] This area has a center from which patterns are diffused, radiating out "with diminishing strength." In this area are various complexes consisting of bodies of related traits, organized about a dominant trait or activity; and these complexes are often organized about core complexes to which they are functionally related. Sorokin, however, has attacked and modified this concept.[100]

A single illustration of the searchlight qualities of the culture-area-culture-complex concept in the study of a society, when employed by a creative mind, is the work of Rupert B. Vance on "The Cotton Culture Complex."

> There exists a kind of natural harmony about the cotton system. Its parts fit together so perfectly as to suggest the fatalism of design. Nature's harmony of the soil, the rainfall, the frostless season, the beaming sun, and a transplanted tropic plant fit well with a transplanted tropic race, landless white farmers, and the slow but all-surviving mule to supply the world's demand for a cheap fabric. The spinner, the cotton buyer, the landlord, the supply merchant, and the cotton farmer form an economic harmony that often benefits all except the producer, a complex whole that is so closely interconnected that no one can suggest any place at which it can be attacked except the grower; and the grower is to change the system himself, cold comfort for advice. The most heroic measures are suggested to the man most bound by the system.[101]

Chapin, *Cultural Change* (New York, 1928), p. 382. Chapin does not have Ward's theory in mind, however.

[99] *Social Research Bulletin No. 7* (Chicago, 1927), p. 3.

[100] Sorokin, *Social and Cultural Dynamics*, Vol. I, chaps. i-ii.

[101] Rupert Vance, *Human Factors in Cotton Culture* (Chapel Hill, 1929), chap. x.

The complex involves maize kernel, salt fat pork, cornbread, and molasses in the food habits; women and children working in the field, large families, one crop, the speculative habits or attitudes of the farmers, the luxuries, if any, bought all at once, the shiftless attitudes of the renter, tenant mobility, poverty, illiteracy, the low standard of living, "blowing in" money, and living on credit, as other traits.

Vance shows himself able to envision society with the aid of the culture-complex as a concept and with much first-hand study and acquaintance with the South. His work also suggests the relation of "natural" and "cultural" areas as mentioned by Park above.

The interconnections suggested by these concepts are much akin to Comte's concept of filiation, and do not violate the principle of viewing parts of a cultural configuration in the light of the whole. As for cultural areas, however, it has often been suggested that they are disappearing.

Ralph Linton pictures the modern world as a fluid world in which local groups and local cultures are constantly coming into contact with a larger world; a process in which cultures are being swallowed up and are disappearing. Culture as pattern is thus, in his mind, coming down to a vanishing point, and only a little more than an "assortment of alternatives" is left for the choice of the individual. Invention and diffusion have swamped us and disorganized us. He thinks that perhaps five hundred years from now our culture shall have become reintegrated on more of a world basis. When that reintegration comes, it does not seem likely that it will be merely something into which the world drifts as a sort of "strain toward consistency in the mores." If so, it will be a terrific "strain." If individual choice means so much now, where economics is not concerned (and where it is concerned so far as the consumer is involved), the readjustment will require a multitude of individual choices as well as a great deal of public discussion and social invention. Professor Linton says, "If our civilization collapses it will not fall through lack of intelligence to meet its problems but through lack of any united will to put the new solutions into effect."[102] In other words, the *united will* necessary to put the solutions into effect will have to depend upon what Comte thought of as a subjective synthesis; a synthesis which must take place in the axis of time, to bring in consensus and the integration of purpose.

[102] Ralph Linton, in Kimball Young, *Source Book for Sociology*, p. 47.

V. THE SUBJECTIVE SYNTHESIS AND THE FUTURE OF MANKIND

Comte's charge against the metaphysical attempts to remake society in a single generation following the French Revolution was that they lacked historical perspective; he knew that progress is dependent upon order, and that order is dependent upon continuity; and he knew that, when society is viewed in the axis of time, the influence of the past and of the future upon the present appears.[103] Comte stressed a knowledge of the past as necessary in order to predict the future; but Wheeler has gone further in expressing the influence of the future on the present in his *organismic laws.* Purpose, goal, valence, field-force, ego-object stresses, foresight, all are involved.[104] We have thought so much of the influence of the past on the present, or the need of scientific study based simply on the data of sense, that some of us have concluded that we are the complete creatures of custom, while others have affirmed that goals are not subjects for study. Such a view is wrong; nevertheless, goal values, ego-object stresses, and the restraining and facilitating forces which affect us in our quests for goals are greatly influenced by the past. As Tylor remarks in his own inimitable way:

> It needs but a glance into the trivial details of our own daily life to set us thinking how far we are really its originators, and how far but the transmitters and modifiers of the results of long past ages. Looking around the rooms we live in, we may try how far he who only knows his own time can be capable of rightly comprehending even that. Here is the "honeysuckle" of Assyria, there the fleur-de-lis of Anjou, a cornice with a Greek border runs around the ceiling, the style of Louis XIV and its parent the Renaissance share the looking glass between them. . . . They who wish to understand their own lives ought to know the stages through which their opinions and habits have come to be what they are. Auguste Comte scarcely overstated the necessity of this study of development when he declared . . . "no conception can be understood except through its history." . . . Attempts to explain by the light of reason things which want the light of history to show their meaning, may be instanced from Blackstone's Commentaries. . . .[105]

But we must not forget the scientific significance of the future. If we cannot understand the present without the past, we are just as helpless without the future; for mechanistic explanations fail.[106]

[103] *Positive Philosophy,* Bk. VI, chaps. i-ii, xii.

[104] R. H. Wheeler and F. T. Perkins, *Principles of Mental Development* (New York, 1932), pp. 33-36.

[105] E. B. Tylor, *Primitive Culture* (New York, 1871), pp. 17-20.

[106] Clarence E. Ragdale, *Modern Psychologies and Education* (New York, 1932), pp.

The law of configuration raises again the problem of *response to the future*. . . . A moving body is conditioned in part by factors in the system that are ahead of the body in time. This same fact may be restated under the law of configuration. The parts of a disturbed energy system are so adjusted dynamically that their behavior in the present actually depends upon relations that are to be effected in the future, namely, the relations of re-established balance. . . . The remote stage of an activity must be guaranteed before the first stage will commence.[107]

This factor is sometimes apparent in the market. Of course, the remote stages of our activities today in society are not apparent (with regard to large group and class relations) even to the body of men who call themselves social scientists. That is one reason why the world of nations, races, classes has not already begun some things which, not begun, will result in the continuance of "the natural laws of social convulsion"[108] and unstable configuration but which, begun with the confidence that they could be carried through, would eventuate in world unity and peace.

It is a little difficult to judge sometimes whether we are experiencing a hang-over from the night before or are really entering into the "beginnings of tomorrow."[109] As the second great war in twenty-five years progresses, "tomorrow" indeed seems very far. But one thing is clear: if tomorrow comes and, with it, peace and any degree of social satisfaction, it must dawn upon a world organization based on a realized world community, which, in turn, as Comte saw, must wait upon the realization of a scientific, if also reverent, attitude in the human mind toward such a community.[110] Such realization and organization can only come out of pushing back the horizon of human imagination until all nations can see the futility of individual state action in attempting to cope with any international problem—can see really how many problems are international

63-64, holds the mechanistic explanation of purpose; cf. E. R. Guthrie, *The Psychology of Learning* (New York, 1935), pp. 243-244, holds that purposivism has failed. These works are quoted in C. E. Skinner, *Readings in Psychology* (New York, 1935), pp. 826-830.

[107] Wheeler and Perkins, *op. cit.*, pp. 33-36.

[108] Sidney A. Reeve, *The Natural Law of Social Convulsion* (New York, 1933).

[109] H. A. Miller, *The Beginnings of Tomorrow* (New York, 1933).

[110] Plainly set forth by Comte as early as 1825. See G. H. Lewes, *op. cit.*, II, 563. Comte was mistaken, however, about industrialization as a concomitant of positivism and peace. In this error he followed Saint Simon. C. K. Streit, in *Union Now*, proposed a union of the ten leading democracies under a common government as capable of controlling the world. Such a union—the time for which was too early until it was too late—before the present crisis might have prevented the war; but it had to wait upon a greater subjective synthesis. But even a union of the democracies on Streit's plan would still leave unsolved the problem of substituting science for force and fraud.

problems. The tariff, immigration, trade agreements, hours-wages, price-fixing, the development of natural resources, the control of production, exchange, colonization, the advancement of science, and many other problems that can never be solved by nationalistic action will demand insight, foresight, and wholesight; and imagination is all of these. How can we deal with the control of agricultural production, for example? It will take insight to comprehend its internal relations, production costs, implications for exchange, standards of living, quality of product, wages, employment, meteorological factors, methods of production, transportation, communication, race relations, and the like; and it will take foresight to predict how all factors operative in the complex, when we have enough insight to discover them, together with factors that may emerge as "acts of God" or out of the human psyche, may push the curve of statistical recording devices up or down one century from now or sooner. It will take knowledge of human nature. It will take the co-operation of the "specialized scientists," forgetting with Comte to be too special, in every nation, ceasing to be so national, themselves organized into a world community of *social* scientists, to the end that multitudinous insights may become synthesized into wholesights. Then the resultant wholesights will make possible the foresight necessary for intelligent planning.

If we may not have this, we may have—nothing better than we have at present and likely not so good. Scientists may scoff at the concept of the Kingdom of God; but if they lack the vision of the organicism of the concept, all they will ever achieve will be the Anarchy of Science. And it may be put down as the closing word of this chapter that an important function of imagination in scientific research is a world organization of research functions operating co-operatively in a society of scientists who are not afraid that a desire to be useful to the society of all mankind, and the unashamed pursuit of that desire, will imply the surrender of the scientific motive. When we move much nearer such a goal, only then will the flowering of that motive have just begun.[111]

[111] On this section, see R. D McKenzie, *The Enlarging World Community*, being Report V of the Albert Kahn Foundation (New York, 1926); William McDougall, *World Chaos* (New York, 1932); C. A. Ellwood, *Man's Social Destiny* (Nashville, 1929); and *World Agriculture: An International Survey* (Oxford, 1932). The best brief study of Comte is C. A. Ellwood, *History of Social Philosophy*, chaps. xxiii-xxiv.

PART IV

CREATIVE FACTORS AND TRENDS IN THE STUDY OF PERSONALITY AND SOCIETY: IMPLICATIONS FOR SOCIAL CONTROL

CHAPTER X

PSYCHOLOGY AND CULTURE IN THE STUDY OF PERSONALITY

"Two scientists are face to face with the visible world. One thinks of breaking it up to see what it is made of. Complex substances he analyzes into simple ones, largely ignoring what he may be losing in the analytical process. At last he comes to the irreducible elements, and is able to announce that all material things are composed of some ninety odd of them. Not satisfied with that, he goes on to break up even the atoms and finds that instead of the invisible, indestructible minima of last century, they are little 'solar systems,' consisting of positively electrified nuclei with one or two or many negative electrons dancing around them. Thus he looks upon the universe as made up of nuclei (of which he confesses he knows but little) and electrons (of which he claims to know that they are all exactly alike)—and nothing else. Thus he has totality divided into ultimate parts which can be mentally reassembled into the huge world-machine wound up ready to go.

"The other scientist . . . takes full cognizance, with equal delight, of the skillful work of the analyst; but he says to him: You must have left something out, something which nature reveals. You take protoplasm from the dead body of a cat and from the dead body of a man, and you say that in both cases it is chemically a very complex substance, but that you can still give all the parts of it, and your analysis makes the two protoplasms the same. Something has been left out, for the life of man is much higher than the life of a cat, and in both cases it is the protoplasm that carries the life."—Monsignor Kolbe

I. INTRODUCTORY

IT HAS SOMETIMES been claimed that psychology must go to biology or physiology for its data, that social psychology must depend upon the psychology of the individual, and that sociology, to understand the essence of culture, has only to extend to its study the methods and insights of social psychology. Surely, a large majority of sociologists since Comte would agree that physical and biological sciences are indispensable sources of information for the psycho-social sciences to which the latter must go for an understanding of the physical aspects of its basis.[1] Yet, the extent to which other elements and emergents enter into the making of the social order can never be discovered by appealing to the very sciences whose field is not the study of such emergents. Physics and chemistry make mutual contributions. Organic chemistry, whether or not it is the beneficiary of biology, cannot grapple by its methods with the biological

[1] Carl Kelsey, *The Physical Basis of Society* (New York, 1928).

process.[2] It must leave process to a genetic approach, which is the essence of real biology. If psychology is biology, it is such with a difference; it must take into consideration the whole organism in its total environment —an environment which, for the human animal, organisms of its kind have largely created. Its subject matter is the dynamics of behavior, whether adaptive or creative, and its distinctive data require distinctive methods and measurements. If, indeed, the student of culture must appeal to psychology for information promoting an understanding of group life and culture, it is nonetheless true that psychologists may greatly enrich the understanding of the human animal and personality by observing how man's behavior is modified in his cultural milieu. Any entity is known by what it does, because it is formed for functioning in relation to other functioning forms in an organic whole. That organic whole in human society, in so far as it exists, happens to be a cultural system, whose existence is as unconscious a medium for its unsophisticated personalities,[3] some of whom are sociologists and psychologists, as water is to a fish; and it is just as necessary; for the functioning of the former is as difficult as that of the latter out of its medium.

In the social process, isolated groups have developed independent cultures, each through the process of collective interaction developing for its personalities common experiences out of which grow common appreciations, expectations, rights, obligations, ranks, kinships, and duties. While persons in such group cultures develop common experiences, they inevitably also develop individual experiences, unique through the factors of age, sex, contingency, the inevitability of individual private worlds, individual roles, and so on. These differentiated experiences must be understood as entering into the process of group integration and social differentiation as well as growing out of such differentiation. Yet, there is enough common to the constituent personalities of a group culture, and great enough difference between these personalities and those of other cultures, that an outsider must cease to be an outsider, if he seeks knowledge of the group's life, to the extent that he can participate in its interactive system. As we have seen, understanding requires "feeling one's self into" as well as "feeling with" a group.

[2] Ludwig von Bertalanffy, *Modern Theories of Development*, trans. J. H. Woodge (London, 1933), esp. chaps. ii and iii.

[3] Edgar T. Thompson, "The Grammar of Society," *Sociology and Social Research*, XIX (1935), 510-511.

II. CULTURE IN THE UNDERSTANDING OF HUMAN DRIVES AND THE SYMBOLS OF THEIR EXPRESSION

The first contribution, then, that the study of cultures makes to psychological insight is a clearer understanding in the fundamental human drives and the symbols of their expression. For, as Boodin says, "Human beings are not physiological automata, but social beings," whose "conduct can be understood only as we understand their interstimulation within a network of social relations, within a cumulative tradition."[4] Margaret Mead has also demonstrated this fact in her studies of *Sex and Temperament* among the Arapesh, the Mundugumors, and the Tschambuli in New Guinea.[5] The followers of Watson, McDougall, and Freud must surely, therefore, in the light of the Gestalt nature of human behavior, avoid all stereotypes. What instinctive stereotypes, for instance, or behavioristic or Freudian formulae, for that matter, can survive an attempt to understand the following behaviors, whose meanings exist in the fact that they are the components of cultural Gestalten? In the light of these behaviors what becomes of the atomic concept of the "economic man," the biohom, the socius, the parental instinct, the profit motive, and stereotyped expressions of anger, fear, and love? What has the ethnologist observed? We begin:[6]

Few Andaman children over six years old live with their parents. Furthermore, an Andaman parent considers it a compliment to be requested by a visitor to permit him to adopt one of the children. On the Island of Merlau, the first man to plant a leaf of Cycas tree before a house in which a child is born becomes the father of the child. Let the outsider with his Western stereotypes try to understand that. Or let an American Indian, an inhabitant of New Guinea, or an Eskimo try to understand corporal punishment in an English family. Or let the rank outsider explain warlikeness and unwarlikeness in different tribes. Moreover, a plains Indian goes to war armed with only a "coup" stick. A Bechuana quarrel always ends without physical combat. Two Santa Marta Indians in Colombia, when mutually incensed, talk insultingly to a tree or rock as they beat it with a stick, until one of the two has broken his stick. Eskimos quarrel by singing abusive songs. A Northwest Coast Indian,

[4] "The Law of Social Participation," *American Journal of Sociology*, XXVII (1921), 25.

[5] *Sex and Temperament in Three Savage Societies* (New York, 1935).

[6] See Klineberg, *Race Differences*, chap. IV. Cf. N. Miller, *The Child in Primitive Society* (New York, 1928), and A. J. Todd, *The Primitive Family as an Educational Agency* (New York, 1915).

wishing to embarrass an opponent, gives a potlatch that will make him a poor man. A Kaffir boy kicks a pile of sand and thus insults another. A Tlingit woman hushes up another with whom she is quarreling by scattering money in an onlooking crowd. A Chukchi or Koryak in Siberia shares his spoils with the whole community. Yakuts did not believe the ethnologist who told them of rich and populous cities in which people died of starvation. A Fijian buries his aged mother alive as a mark of duty and love. An Australian Arunta lends his wife to a guest. A Kirgiz woman in South Africa sometimes asks her husband for more co-wives. An Australian woman kills one of her two sons, saying, "Oh, too much young fellow Jimmy; no good two-fellow pickaninny." The inhabitants of New Guinea practiced boy infanticide, while, in Tahiti, the natives practiced girl infanticide. Bahongo prefer daughters to sons, since "there is not only the portion of their marriage money, but they cry longer and better than boys and men." The Andamanese put the secret burning of wax above theft, lying, and murder in the criminal code as the worst crime of all. An Australian may feel under obligation to go from one tribe to another to spear a woman out of respect to his first wife who has died a natural death. Large numbers of Japanese commit hari-kari. Suicide is rare among American Negroes, while African Negroes may commit suicide over the death of a cow. A Polynesian is ashamed to eat in the presence of another. A Fuegian modestly wears a cloak on his back, while completely nude in front. A nude Australian girl is ashamed without a ring in her nose. Maori do not cry when friends leave, but when they return. And, last of all, Maori, in greetings, rub noses; the Australians rub faces; the Chinese place nose to cheek; and the Westerners kiss, while some practice spitting on the beloved.

Let the behavorist, however, with Watsonian stereotypes, if he has them, take no comfort from this indicated destruction of a biological psychology; for the Watsonian descriptions of the emotional responses of anger, fear, and love cannot explain why the Japanese smile on so many occasions when others scowl, why some people laugh when they are suffering intense pain, and why the people of one culture are so placid while others are quite otherwise. Furthermore, in the light of cultural differences between the emotional responses manifested in different peoples, there is no evidence that emotion is itself in the nature of a mechanical response.

On the other hand, let those who regard attitudes as "forms of readiness for response," which fall definitely within the psychological arena as "motivational concepts," always "psychobiological" and within single individuals, coming out of common instinctive needs and peculiarities of individual inheritance, as Allport and Schanck hold, also remember, with these writers, that these attitudes may be transformed by the environment.[7] But let them, also, remember that the biologist has no monopoly on the explanation of "readiness-for-response"; and if motives may be transformed by the environment into "dynamic and personalized forms," the authors can have no quarrel with Gestalt ethnologists. The truth is that the psychologist and the culturologist are very much in need of one another if they are to attain any wholeness of vision. The culturologist knows, for instance, that culture does not put the instinct of pugnacity in newborn babes; and that it cannot take the desire for specific goals which afford a feeling of security, new experience, recognition, and personal response out of them. But he also knows that an earlier opinion of William McDougall that the instinct of pugnacity has played a leading part in the bloody wars of Christendom is probably false.[8] He recognizes with Hiller[9] that original nature does not furnish any of the specific occasions, values, dates, implements, or plans of warfare. He knows that nobody is either a Frenchman or an American by birth; that any baby can be made into a Bolivian with about the same ease as he can be made into a German; and that he has to acquire his flag, his *Kultur,* his religion, his ideals, or his totem, for which he as readily accepts a goat as a tiger. It will take him many years to find sixty-four types of insults with the German students over which to fight duels, and then he may never learn even so much as one. He may never discover that he ought to hunt heads, take slaves, capture wives, die for Ethiopian deserts, bomb English, German, and Chinese cities, protect with life and limb the ill-gotten gains of foreign investors who exploit other groups, fight for territory already as thickly populated as his own, or pit himself with his compelling idealism against the foreign youth with an equally compelling

[7] "Are Attitudes Biological or Cultural in Origin?" *Character and Personality,* IV (1936), 195-205; cf. G. W. Allport, *Personality: A Psychological Interpretation* (New York, 1937), pp. 112-121.

[8] *Social Psychology* (15th ed.; Boston, 1923), pp. 286-287. Raymond Pearl's last article in *American Journal of Sociology,* XLVI (1941), 487-520, on "Some Biological Considerations about War," shows that, unlike McDougall, he held to a biological explanation of war to the very end.

[9] E. T. Hiller, *Principles of Sociology* (New York, 1933), chap. xvii.

idealism on the field of death. Even after he has grown up, he still has to wait on his leaders to tell him whether he is at war or peace with other groups.[10] And his leaders have to lie to him and, oftener than not, make a conscript of him to get him to participate in the pugnacious sport of war.

III. CULTURE AND THE DESTRUCTION OF STEREOTYPES

The second contribution of the study of culture to psychological insight, then, is the destruction of stereotypes. The best example of all, however, of psychological stereotypes, which must give way in the light thrown upon them by the concept of culture, are those of Freudian psychology. Consider the Oedipus complex in different cultures. Malinowski tells us that, among the Trobriand Islanders, there is the repressed desire, not to kill the father and marry the mother, but to marry the sister, who is isolated from the brother in separate quarters and strictly secluded, and to kill the maternal uncle, who is their social father.[11] According to H. D. Lasswell, while Freud stands for a single fundamental complex for all mankind, Malinowski stands for different sentiment clusters for father-right and mother-right societies; but, he adds, further investigation may show that, instead of two, there are many sentiment clusters in different cultures.[12]

Another Freudian technique, which is at once the product of a rich imagination and of an imagination that ranges very far without ranging very widely is the symbolism of the libidinal dream. Dr. C. G. Jung, who claims to modify and broaden the Freudian concept of the libido, making it the entire life-force rather than mere sex-energy, shows by his narrow interpretations of dreams how much the psychologist needs the concept of culture to broaden his imagination and at the same time to keep it from running wild. In *Psychology of the Unconscious,*[13] he interprets Miss Miller's dream-poem, "The Hymn of Creation," by a technique which the concept of culture would surely modify.

Miss Miller, a poetess aboardship in Italian seas, has carried on an innocent flirtation with an officer who sings on the nightwatch, and for whom she has written a love song of a not too serious kind. One night, this young woman, who was acquainted with Job and Milton and literature and music in general, fell asleep and dreamed the passage from

[10] Walter Lippmann, *Public Opinion,* chap. i.
[11] *Sex and Repression in Savage Society* (New York, 1925), p. 81.
[12] Stuart A. Rice, *Methods in Social Sciences,* Analysis 34.
[13] Trans. Beatrice M. Hinkle (London, 1922).

Job, "When morning stars sang together," resounding in a choral creation, which blended itself with an oratorio she once heard and with memories of *Paradise Lost*. She says:

Then from out of this whirl, there slowly emerged certain words, which arranged themselves into three strophes and, indeed, they seemed to be in my own handwriting on ordinary blue-lined writing paper on a page of my old poetry book which I always carried around with me; in short they appeared to me exactly as some minutes later they were in reality in my book. Here they are:[14]

When the Eternal first made Sound
A myriad ears sprang out to hear,
And throughout all the Universe
There rolled an echo deep and clear
All glory to the God of Sound!

When the Eternal first made Light,
A myriad eyes sprang out to look,
And hearing ears and seeing eyes,
Once more a mighty choral took:
All glory to the God of Light!

When the Eternal first gave Love,
A myriad hearts sprang into life;
Ears filled with music, eyes with light
Pealed forth with hearts with Love all rife,
All glory to the God of Love![15]

And here is Jung's interpretation. A handsome officer, who has produced a powerful impression on her, sings under the stars at night. The sound of his voice, the stars, her erotic impression, and a sublimated libido produce in a dream the hymn to the God of Sound, Light, and Love. Clearly enough, Jung has accounted for one factor in the phenomenon, without saying that it is the only one, but apparently implying that it is. The existence of the constellation of psychic components producing the dream-poem, furthermore, seems somewhat blurred in his mind, whether true or not, by his absorption in the libido, which he thinks of as a universal force in man. If universal, then it could not explain why this particular girl dreamed this particular poem or any other poem at all. Suppose she had not been a poet, had not heard the oratorio, or read Job or Milton, or had a multitude of other experiences that made such a dream possible. In short, if she had not had the organization of personality

[14] *Ibid.*, p. 28. [15] *Loc. cit.*

making for the sublimation of her erotic impression, as Jung would be quick to say, it might have found a direct expression or a harmful repression. In spite of this position, however, creative imagination in Jung probably follows too narrow a lane of explanation. Even granting that the libido has selected the passages from Job, Milton, and Handel's oratorio, "The Creation," it evidently could not select what had never entered into her experience or by any reason explain all that had ever entered her experience.

If individual experience has so much to furnish in the way of dream components, and the culture of the group furnishes so much of the content of the individual's experience, we may then see the tremendous importance of the concept of culture in controlling the imagination of the psychologist in the formation of hypotheses.

The most notorious example of all in Freudian psychology of a universal stereotype, however, is the concept of dream symbolism, which is too well known to review.[16] In his *Conflict and Dreams*,[17] Rivers very greatly modifies, if he does not almost destroy, Freudian stereotypes in dreams.

These criticisms, however, do not deny the value of Freud to our understanding of human nature. The whole school has learned much through dramatic insights into human personality.[18] Ferrero declares:

> Theory, which gives to facts their values and significance, is often very useful, even if it is partially false, for it throws light on phenomena which no one observed, it forces an examination, from many angles, of facts which no one has hitherto studied, and it gives the impulse for more extended and more productive researches. . . . It is, therefore, a moral duty for the man of science to submit to criticism, in order that science may continue to progress. . . .[19]

IV. CULTURE AND MEASUREMENTS OF PERSONALITY

The third contribution of the study of culture to the study of psychology is just at that point where psychology has attempted to enter the field of sociology and anthropology; namely, the testing, rating, and measuring of personalities, and grouping them according to their relative

[16] *Interpretation of Dreams*, trans. A. A. Brill (New York, 1913).

[17] New York, 1923.

[18] See esp. E. W. Burgess, "The Influence of Sigmund Freud upon Sociology in the United States," *American Journal of Sociology*, XLV (1939), 356-374, and immediately following, H. D Lasswell, "The Contribution of Freud's Insight Interview to the Social Sciences," pp. 375-390.

[19] Jung, *op. cit.*, p. 7, quoting *Les Lois Psychologiques du Symbolisme* (1895), p. viii.

abilities, especially in matters of class, caste, race, and nationality. Intelligence tests standardized within one cultural configuration have been put to uses, even by their makers, to which they could not extend. If, however, the unwise use of intelligence tests were a mere matter of academic interest, little attention should be given it; but the conclusions of psychologists are influential in shaping public opinion and public policy, and have weight in the rationalizations of international relations.

Consider for a moment what the testers and measurers of the human animal and person have told us about the biochemical differences of forward and backward races, the significance of racial constitutional types, basal metabolism, reaction time, visual sensitivity, the tactual, auditory, and olfactory senses, and comparative intelligence scores of different groups, all being "measured," often, without proper appreciation of the fact that not even basal metabolism is uninfluenced by the fact of cultural configuration.[20] Consider, too, that social leaders and masses like to believe in the weakness of outgroups and in their own infallibility, and it becomes apparent that the ethnologist has a voice for the public ear, which must be heard in part through the psychologist, yea even through the research psychologist! For the powerful of the earth like to say, with Karl Pearson, "It is our duty to go and drive out the backward races!"[21]

There is an article by M. Bleuler and R. Bleuler, reporting racial "mental peculiarities of Moroccans," which the writers think were laid bare by Moroccan performance on the Rorschach ink-blot tests.[22] Since the Moroccans did not see the same images in blots that Englishmen or Frenchmen see, and since they showed some tendencies to make similar responses among themselves, the Bleulers think that the phenomenon requires a racial explanation; that these imaginal differences had their roots in the genes. But, as Bartlett demonstrated, differences in individual experiences are correlated with the imaging tendencies of performers on ink-blots.[23] Therefore, since the Bleulers seem quite innocent of the notion of the significance of a cultural apperceptive mass, their conclusions must be discounted. In fact, their conclusions must be discounted because of their lack of synoptic vision—their inability to see the full range of the field of forces operating in the control of Moroccan behavior. These

[20] Otto Klineberg, *Race Differences*, chaps. iii, x.

[21] Quoted in Sorokin, *Contemporary Sociological Theories* (New York, 1929), p. 260.

[22] "Rorschach Ink-Blot Tests and Racial Psychology," *Character and Personality*, IV (1935), 97 ff.

[23] *Remembering* (Cambridge, 1932), pp. 35-36.

writers illustrate, however, the manner in which so many of the testers reach conclusions from improperly observed behaviors which have meaning only in the light of social configurations.

V. CULTURE AND CONCEPT OF ABNORMALITY

Last, but not least, since culture is the chief factor in determining what a group will consider abnormal behavior,[24] we may turn our attention to the contribution of ethnology to the study and practice of abnormal psychology. John P. Foley writes: "The various civilizations not only vary greatly in their basic control tendencies with regard to a particular behavior segment, but actually inculcate the behavior patterns 'normal' to their specific cultures in their constituent members."[25]

When Otto Klineberg holds that abnormality is "simply deviation from the accepted pattern, whatever that may be,"[26] he is supporting John P. Foley in his statistical concept of abnormality up to a certain point. Foley holds that his statistical norm is supported by individual deviations from cultural norms. But he gets no comfort from Moss and Hunt, who object to such "subjective" and submit what they consider an objective test of abnormality, which will be universally valid—the materialistic test of physiological fitness.[27] But neither Moss and Hunt, with their objective test of physiological functioning, nor Foley with his statistical concept, which he considers objective, do complete justice to the tests of the normal. When Foley holds that a man who is abnormal in culture X may be more nearly normal in culture Y because of that abnormality in group X,[28] within certain limits, he is right. No doubt he would, or ought to, agree, however, that it is adjustive efficiency with group Y and not a measurable deviation from the central tendency of X which really accounts for the facts. For adjustive efficiency as a norm takes account of functional differences in group constituents, while the statistical norm does not. Statistical deviations indicate differences, which Foley calls abnormal, but they do not indicate the functional value of these differences to a social configuration. The functional value of these differences is determined by the patterns of the group culture.

[24] See Margaret Mead, *op. cit.*, chap. xviii; cf. Mead, *Cooperation and Competition among Primitive Peoples* (New York, 1937), pp. 497-511.

[25] "The Criteria of Abnormality," *Journal of Abnormal and Social Psychology*, XXX (1935), 287.

[26] *Op. cit.*, p. 291.

[27] F. A. Moss and W. A. Hunt, *Abnormal Psychology* (New York, 1932).

[28] Cf. Margaret Mead, *op. cit.*, chaps. viii, xiii, xvi, xviii.

The part that culture plays in a social configuration makes more difficult the position of Moss and Hunt, while Benedict puts too much stress on the force of culture. Klineberg comes nearer to the true view. After citing Benedict, who holds that "the majority of the individuals in any group are shaped to the fashion of their particular culture" and can be made to act in that fashion which the culture institutionalizes, even when that is one which we in our society regard as abnormal,[30] Klineberg denies that "the concept of abnormality has any exclusively cultural significance." For, he says, there is a real difference "between the Hindu mystic who has achieved a voluntary control over the posture of his body, and the catatonic who remains rigid in response to some inner uncontrollable need."[30] But, granting all this, there are some cultural configurations in which one type of personality can perform a highly acceptable role, while, in another, a person of that type would be considered demoralized and disintegrated.[31]

R. H. Lowie is right in stressing the services of abnormal psychology to ethnology, but he just as properly remembers the services of ethnology to abnormal psychology. Stressing the reality of the trances, he makes quite clear the part that the cultural configuration plays in defining the shaman's office and in making use of that type of personality.[32]

Having observed the concept of the abnormal in the light of the nature of group life and of personality roles within cultural configurations, we may correctly contend that it is adjustive efficiency, that is, ability to meet crises without breakdown, to face barriers without demoralization and frustration when these barriers stand between him and the achievement of his personal satisfactions in a given culture that constitutes the test of whether a particular mode of response will indicate normality or abnormality. This same concept takes account of all aspects of physiological efficiency and of cultural variation; for some physiological variants can function successfully in no culture, while others, unable to adjust in one group, function successfully in another group. The nonconformist with adjustive efficiency may sometimes exert an influence to modify objectionable traits of his culture, thus adjusting the group to him. On the other hand, the nonconformist, like Jesus of Nazareth, may be

[30] Klineberg, *op. cit.*; see Ruth Benedict, *Patterns of Culture* (New York, 1934), chap. viii.

[30] *Loc. cit.*

[31] J. S. Plant, *Personality and the Cultural Pattern* (New York, 1937), chap. ii, throws interesting light on the "pliability of the personality" and the "pliability of the environment."

[32] *Culture and Ethnology* (New York, 1917), p. 26.

able to accept present defeat objectively, being, as Woodrow Wilson said, willing to take the long view and "play for the verdict of mankind." It is thus that we may extend the definition of normality to include not only the conformist but also the creative personality. At the same time we may conclude, in the light of both ethnology and psychology, that adjustive efficiency, rather than statistical deviation or physiological functioning, is a universally valid criterion of normality, applicable to all cultures and to all groups.

CHAPTER XI

RECENT TRENDS IN SOCIOLOGY, SOCIOLOGICAL INSIGHT, AND SOCIAL CONTROL

". . . Science, conscious of its purpose, can in the long run become a major force in social change. . . . But science, unaware of its social significance, becomes a helpless tool in the hands of forces driving it way from the directions of social advance, and . . . destroying its very essence, the spirit of free inquiry. To make science conscious of itself and its powers it must be seen in the light of the problems of the present and of a realizable future. It is in relation to these that we have to determine the immediate functions of science.

"We have in the world to-day a number of palpable material evils—starvation, disease, slavery, and war—evils which in previous times were accepted as a part of nature . . . but which now continue solely because we are tied to out-of-date political and economic systems. There is no longer any technical reason why everyone should not have enough to eat. . . . War, in a period of potential plenty and ease for all, is sheer folly and cruelty. The greater part of disease in the world to-day is due directly or indirectly to lack of food and good living conditions. All these are plainly remediable evils, and no one can feel that science has been properly applied to human life until they are swept off the face of the earth. . . .

"These are all, however, but negative aspects of the application of science. . . . It is the function of science to study man as much as nature . . . to discover social needs. The tragedy of man has too often lain in his success in achieving what he imagined to be his objects. Science . . . should be able to determine far more clearly which are the real and which are the more fantastic elements of personal and social desires. Science brings power and liberation, just as much by showing the falsity and impossibility of certain human aims, as by satisfying others. In so far as science becomes the conscious guiding force of material civilization, it must increasingly permeate all other spheres of culture."—John Desmond Bernal

I. INTRODUCTORY

A DOZEN YEARS have elapsed since W. F. Ogburn made the address on the "Folkways of a Scientific Sociology," reference to which opened the introductory chapter to this treatise. It will be recalled that he prophesied that American sociologists in the future would be given much less to intellectuality and much more to fact-finding than in the past. Perhaps, in the latter, a decade has indicated that he is right; but there seems to be little indication that, among most sociologists, there is any less stress on the former.

That there would be less of creative thought in sociology could hardly

be what Ogburn meant to indicate. He probably meant that sociologists would be investigators *first* and thinkers afterwards. They must, however, be *thinkers first, last, and all the time,* however much investigation and quantification they may indulge in.[1] And Ogburn has continued to do some creative thinking, regardless of the fact that agreement with his hypotheses has not resulted from his outstanding labors at quantification.[2]

That there has been some very good thinking both with and without the aid of statistical techniques in the last decade is evidenced by reference to a few of the more important sociological and sociopsychological works, the titles of which appear below.[3]

[1] The reader may recall in this connection the remark of Karl Mannheim in his review of Stuart A. Rice (ed.), *Methods in Social Science,* about the work which launched a decade promising great advances in quantitative social science: "To confine ourselves to Rice's compendium, we must admit a very marked and painful disproportion between the vastness of the scientific machinery employed and the value of ultimate results. The subject and title of most contributions evoke the highest expectations; yet after having reached their conclusion, one is tempted to ask disappointedly: 'Is this all?'" In *American Journal of Sociology,* XXXVIII (1932), 275.

[2] Ogburn's article on "The Limitations of Statistics" shows that he felt the need of correcting some erroneous conclusions that might become a part of the "folkways of sociology." See *American Journal of Sociology,* XL (1934), 1-20.

[3] Gordon W. Allport, *Personality: A Psychological Interpretation* (New York, 1937); Madison Bentley and E. V. Cowdry, *The Problem of Mental Disorder* (New York, 1934); Ruth Benedict, *Patterns of Culture;* Harry Elmer Barnes, *Society in Transition* (New York, 1939); L. L. Bernard, *Social Control in Its Psychological Aspects* (New York, 1939); E. W. Burgess and L. S. Cottrell, *Predicting Failure or Success in Marriage* (New York, 1939); C. M. Case, *Social Process and Human Progress* (New York, 1931); John Dollard, *Criteria for the Life History;* John Dollard, *Class and Caste in a Southern Town* (New Haven, 1937); C. A. Ellwood, *History of Social Philosophy;* R. E. Faris and H. W. Dunham, *Mental Disorders in Urban Areas* (Chicago, 1939); S. and E. T. Glueck, *One Thousand Juvenile Delinquents;* Alexander Goldenweiser, *Anthropology* (New York, 1937); E. T. Hiller, *Principles of Sociology;* W. Healy and A. F. Bronner, *New Light on Delinquency;* Floyd N. House, *Development of Sociology* (New York, 1936); Hornell Hart, *Technique of Social Progress;* R. S. and H. M. Lynd, *Middletown in Transition;* E. T. Krueger and W. C. Reckless, *Social Psychology;* Otto Klineberg, *Race Differences;* R. S. Lynd, *Knowledge for What? The Place of Social Science in Our Culture* (Princeton, 1939); G. H. Mead, *Mind, Self, and Society;* Margaret Mead, *Sex and Temperament;* R. M. MacIver, *Leviathan and the People* (Baton Rouge, 1939); Gardner Murphy and T. M. Newcomb, *Experimental Social Psychology* (New York, 1937); C. C. North, *Social Problems and Social Planning* (New York, 1932); H. W. Odum, *American Social Problems* (New York, 1939); Talcott Parsons, *The Structure of Social Action;* A. F. Raper, *Preface to Peasantry* (Chapel Hill, 1936); J. S. Plant, *Personality and the Cultural Pattern;* Walter C. Reckless, *Criminal Behavior* (New York, 1940); *Recent Social Trends;* C. R. Shaw and M. E. Moore, *Natural History of a Delinquent Career* (New York, 1931); P. A. Sorokin, *Social and Cultural Dynamics;* W. I. Thomas, *Primitive Behavior* (New York, 1937); Frank Tannenbaum, *Crime and the Community* (Boston, 1938); L. M. Terman, *Psychological Factors in Marital Happiness* (New York, 1938); Willard Waller, *The Family: A Dynamic Interpretation* (New York, 1938); Kimball Young, *Social Attitudes* (New York, 1931); Florian Znaniecki, *Social*

If all but the strictly measured elements were to be shorn from these works, even those that depend heavily on statistics would hardly have any value or be highly intelligible. For tables of statistics do not constitute either science or measurement. Furthermore, the value of each one of these works varies directly with the amount of imagination that went into its creation.

We find a certain group, nevertheless, holding out through the decade and making a number of converts, whose stress upon the physical science viewpoint has not been accompanied by very much creative thinking. On the other hand, another group, sharing the insights of the functionalists and influenced more recently by the Gestalt psychologists, have not been caught in the traditionalism of physical science terminology. Before considering the expansion of functionalism and the trend toward Gestalt theory, we shall follow for a while in the steps of the physicochemical theorists and then return to what might be called neofunctionalism as the more representative trend.

II. THE PHYSICOCHEMICAL OR THE "OPERATIONAL" SCHOOL OF SOCIOLOGISTS

Those who are anxious to apply the methods of physics and chemistry to the study of society have in recent years come to be known as the "operational" school. This school is represented by a number of writers for the *American Sociological Review*. But some recent issues of the *American Journal of Sociology,* which serves as a forum for many divergent views, contain a number of articles which indicate the leading principles of the school. This is particularly true of the paper by George Devereux on "A Conceptual Scheme of Society."[4]

But the two men who have assumed the leadership of the "operational" school are George A. Lundberg and S. C. Dodd. To the latter the former makes fifty-nine references in his *Foundations of Sociology.*[5] His next most frequent reference is to F. S. Chapin. His third most frequent source is P. A. Sorokin, who, in his review of Lundberg's book in the *American Journal of Sociology,* figuratively blisters him for his pains.[6]

Actions (New York, 1936). E. A. Hooten, *Crime and the Man* (Cambridge, 1939), represents statistics without accurate thinking.

[4] *American Journal of Sociology,* XLV (1940), 687-706; cf. the article by Herbert Blumer immediately following (pp. 707-719), "The Problem of the Concept in Social Psychology," which is appropriately placed and serves, whether planned to do so or not, as an excellent reply to the operational viewpoint just presented.

[5] New York, 1939.

[6] XLV (1940), 795-798.

Next Lundberg refers most frequently to C. H. Cooley, his former teacher, though the ideas of the two men are poles apart. To Ogburn, who made an unqualified prophecy of trends toward quantification, he refers eight times. The constant appeal to Dodd is a natural result of Lundberg and Dodd's collaboration, the latter writing a "source book" on *The Dimensions of Society*.[7]

What Lundberg and Dodd conceive as being the "dimensions of society" they have seen, necessarily, through the dimensions of their method, to which we may turn.

III. THE OPERATIONAL METHOD

In the preface to his impassioned plea for the observations of quantitative folkways in sociology, Lundberg warns us that we shall look in vain within the scope of the particular writing for evidences of the quantification of his theories. He leaves that to Dodd.[8] In this preface he also gives us a further instruction "to begin with." "To begin with," he says, ". . . in adopting this view I am not assuming that this or any other approach is dictated by the data."[9] For all Lundberg claims to know about the universe or any part of it is that it consists of *"that which"* evokes responses. *"That which"* evokes responses includes physical nature, man, and culture as parts of the cosmos. And "the cosmos is a word by which we designate the sum total of all the influences that precipitate responses in man."

Lundberg's hypothesis is that the nature of *"that which"* evokes responses in man does not at all concern us in science.[10] He warns us that

> Scientists had better confine themselves to a modest postulate of "x" [he puts "x" in quotation marks just as he does *mind* and *meaning*] which precipitates our responses and the nature of which we tentatively infer from these responses. . . . The justification of even the postulate of the "x" had better be its demonstrable efficiency in helping us to comprehend our world rather than in vociferous declarations about its "existence" and "truth."[11]

An immediate objection is hardly within the scope of our present purpose. But if all that evokes responses is "x," the sum total of which makes up the cosmos, and if man is a part of the cosmos, to follow Lundberg is only to get as the formula for human behavior, x responds to x, which does not prove very enlightening to the uninitiated. Substituting "x" at

[7] New York, 1939.
[8] *Op. cit.*, p. ix.
[9] *Ibid.*, p. viii.
[10] *Ibid.*, p. 10.
[11] *Ibid.*, p. 15.

every point where it becomes logically permissible in the quotation above, we get:

> *X* had better confine *x* to a modest postulate of *x* which precipitates *x's* responses and the nature of which *x* tentatively infers(?) from these responses. The justification of even the postulate of *x* had better be its demonstrable efficiency in helping *x* to comprehend(?) our *x* rather than in vociferous declarations about its *x* and *x*.[12]

Lundberg's insistence on responses as the data of science rests in his assumption that only responses are observable and measurable, while *mind, thought, feelings, ends, motives,* and *meaning* are not "operationally" definable or observable and, therefore, not subject to the exact treatment of physical science methods. But he wishes to assure us that, really, he is banishing none of these data. To this end he contends that he no more ignores "the phenomena of 'imagination,' 'thought,' or 'consciousness'" than "physicists deny the phenomena of shadows and echoes."[13] But since physicists demand sensory evidence of such inconsequential phenomena, social scientists must also demand such evidence of analogous(?) phenomena in human behavior. "When he has such evidences he is as much interested in the phenomena of what men think and feel as in any other data."[14]

While Lundberg is careful to make it clear that he is retaining the phenomena of mind, consciousness, thought, feeling, and motives under new rubrics that can be "operationally" defined, he makes it equally clear that the concepts have no value in a causal explanation of human behavior. Hence he must really believe that they are only echoes and shadows. For "needs" and "ends" he substitutes the concept of "equilibrium" which, he believes, is equally applicable in all sciences, since every existing system is only an "electron-proton aggregation." Yet he says that other sciences than the social *could conceivably* use the former concepts. "It is possible to interpret the event of a stone rolling down a hill into a

[12] As E. Faris suggested in his review of C. A. Ellwood, *Methods in Sociology,* in *American Journal of Sociology,* XXXIX (1934), 686-689, the scientist who advocates sympathetic imagination as a method of social understanding has an opportunity to use it in the estimate he makes of adherents of other schools; but pointing out seemingly logical inconsistencies of the other or failing to agree with him is not a sufficient criterion of a lack of sympathetic insight. Furthermore, those who emphasize the necessity of sympathetic insight are just those who show how hard it is to understand another system without being a part of it. If we have misunderstood Lundberg, that fact in no wise disproves our case.

[13] *Ibid.,* pp. 19-20.

[14] *Loc. cit.*

brook as a striving or a need of the stone for the brook. . . . But in the scientific frame of reference we have adopted and defined operationally such terms as 'mass,' 'gravity,' and 'field of force' as more suitable for our purpose. That purpose in science is to explain as much as possible by as few terms or symbols as possible—the principle of parsimony."[15]

In another connection, Lundberg says:

> We no longer find it necessary to bother with the motives of tornadoes, bacteria, or even of the higher animals except man. A description of the conditions under which phenomena occur is considered adequate although at first it seems to "leave something out"—namely, the words "motive" or "purpose." In the social sciences it is felt we must go "farther."(!) We must not only describe the interaction of the components of a situation but we must select . . . some one component and call it *the* motive. . . . It hardly needs to be pointed out that when a person murders his grandmother who happens to hold ("*because* she holds") a large insurance policy in favor of the murderer, the latter is assigned as *the* motive purely on the basis of the frequent recurrence of this and similar components in such situations.[16]

Having thus far stated Lundberg's position with reference to the scientific method to be pursued by sociologists in future, we can best bring further clarification of that position by entering once more an objection, one of three to be offered, to it: that of complete inadequacy of the method to grapple with all the data of society.

IV. THE FIRST INADEQUACY OF THE OPERATIONAL METHOD: PREOCCUPATION WITH ATTEMPTS TO MEASURE SENSE DATA AND SYMBOLS

It is apparent that the operationalists have done three things. (1) They have adopted a measuring technique which is not based on the assumption that their approch or anyone else's "is dictated by the data"; (2) then they have gone out in search of data that can be measured with the kind of measuring stick devised; and (3) they have found that objects of sensation, the external ends of responses, and symbols are the only data to which the chosen technique can be applied. Hence they are preoccupied with the measurement of the external signs of responses and the symbols which serve as stimuli. But it turns out that the interactive responses of persons are not made by an "echo" or a "shadow" to an "echo" or a "shadow" (which Lundberg has made analogous to imagination, thought, feeling, mind, purpose, motive, etc.) or by a symbol to a symbol, but only by *that which* is capable of making responses or casting "shadows," and

[15] *Ibid.*, p. 35. [16] *Ibid.*, p. 222.

of referring "shadows" to their source. "That which" evokes responses and *that from which* responses are evoked are not as shadowy as the operationalists make them. But the very symbols which represent all of reality with which operationalists wish to deal are at least as much like echoes and shadows as are *mind, meaning, motive,* and *imagination, taken not as concepts but as that of which concepts are formed.*

Lundberg rightly objects, however, to confusing a word with that which it is a sign of. The words *mind, meaning, motive,* etc., no one imagines as being like that to which they refer. Yet it is surely more important to have different terms to apply to widely variant phenomena than it is to be so parsimonious with terminology as to call atoms, molecules, animals, men, races, nations, planets, and galaxies all the same thing—electron-proton aggregations.[17] A discriminating use of words is important in science. It is not the scientist who calls a whale a fish.

Lundberg's confusion of equilibrium in a social with the equilibrium of a physical system is evidenced by his attempt to make the word mean exactly the same thing in both. In his example of a rock rolling down a hill into a brook, he makes a man and a stone subject to the same types of influence or the same field forces. But a man may move down a hill into a brook with many more factors impinging upon and working in and through him than ever affect the stone; factors of a different kind. The stone is subject only to a field of physical forces unless the man throws it to attain some end. The comparison between the two holds only when the man loses his footing and falls—the same field of forces is involved then unless the man, for example, is trying to see how close he can get to the brink without falling in. But the brook never means anything to the stone. To the man it may mean a drink, a bath, a means of covering up a trail, a mirror, a "baptism for the remission of sins," a path to follow home, a place to play, a thing to shun, or holy water. And the scientists who can do without the concepts of *striving, need,* and *ends* are not concerned with these phenomena at all, or even with human society.

When the observer sees a stone roll into a brook, he can say so and be done with it; but when a monkey dips a piece of cheese it is nibbling into water from time to time, something more is required than to say that the monkey dipped his cheese into water. What the animal is really doing is what the act means to him (which, in the case observed, was interpreted

[17] *Ibid.*, p. 204.

by the writer as an increase in the edibility of the stale cheese). The act has a distinct end. When the observer sees one man dip another under water, dipping-an-object-under-water is not a sufficient description of what is taking place. It may be a baptismal service, so much horseplay, or just another case of dipping a "cheese." If a man enters a brook, it may mean any of the numerous things suggested above; and the observer often can infer what is taking place only by belonging to the same cultural system and having had similar experiences himself. He knows what the man is doing only in terms of what the man *intends* to do. And he knows what the man *intends* to do only in terms of what the observer himself *intends* when he does similar acts.

What the observer has inferred from objective signs of the conscious states of the man in the brook is through his sympathetic imagination, while what he has inferred about the stone is not arrived at by that process. If he comes into contact with the stone, he does not anticipate that it will sense whatever meaning it has for him in an effort to keep at least one jump ahead of what his next response is likely to be. If he comes into interaction with the man, he does.

Moreover, a physical object never takes the initiative in the change of a configuration to which it belongs; but the man who "murders his grandmother who happens to hold . . . a large insurance policy" in his favor does; at least the meaning that the total situation has for him has more to do with starting the act than have any of the instrumental traits, such as the insurance policy, which are involved in the configuration. These never start anything at all.

There are multiple factors in any social event. But the goals of the organism dynamify every situation of which the organism forms a part; and there is still a sense of the word in which collecting-the-insurance in a case of homicide can be called the motive. The murderer *wants* the money because he *wants* a dozen different things; but the instrumental traits in the configuration *want* nothing at all because they experience nothing at all. When the stone rolls down the hill into the brook, there are factors in its behavior; but no one factor, as we have seen, takes the initiative in changing the configuration. Contrary to the assertion of Lundberg that we have dispensed with the concept of motives—as ends, goals—in all animals except man, we cannot do so for any form of animal life.

Since, however, the operationalists have created their technique and gone out in search of data to fit it, they must neglect such phenomena as *motives* or *ends*. But the validity of any method depends upon the possibility of applying it to the data, the "significant behavior segments," which the researcher proposes to study; and the symbols used should be representative of these behavior segments. Yet the operationalist has not validated his method by either criterion. He must immediately admit to the back door what he has kicked out the front door. His operational definitions do not operate to keep him from using the same words in different senses in the same paragraph. He frequently has to fall back on *thinking, feeling,* and *willing* to express his *meaning*. Lundberg even ascribes *a* motive with a *because* attached to the behavior of those who *"deliberately"* avoid giving an "operational" definition to terms, "because it would definitely circumscribe the *meaning* of words which are now used to express not relations but *feelings* usually vague in *meaning* but strong in *emotional significance*."[18]

It is increasingly evident from Chapter VIII on, that Lundberg cannot make himself understood without the use of such terms. In Chapter VII he introduces from Bentley the terms "dicaud" and "dicaudane," "Communact" and "Communicane" in an effort to free himself from the concept of *meaning*.[19] The word *"Communact,"* he says, "is used to designate 'the general case of men-seen-in-communication in that specialized observation which provisionally defers examination of the *what* that the communication is about.'" But "the word *Communicane,*" he continues, "is used to designate 'the general case of instances of communication in which men are seen in communication-about-something.'" Then he takes the term "communication" to designate that part of the interactive process which is observable through symbolic behavior—gestures, other signs and symbols—and equates it with the "Communicane." "From our point of view," he explains, *"societal* contact, mind, and meaning are included in our definition of communication. For the same reason, intercommunication is a redundant term."[20] But according to the logic of this definition, the treatise from this point on is full of redundant terms.

The spatial and temporal distribution of men and events, with individuals as centers of influence in a field of force, being redistributed like men on a chessboard and with no more initiative than the chessmen take

[18] *Ibid.*, p. 59. Italics are mine.
[19] *Ibid.*, pp. 254-255.
[20] *Ibid.*, p. 253.

themselves in the process, is the concept of society presented in Part III.[21] The *Foundations of Sociology* rests upon the conception of a region in which *"all of man's 'mind,' 'thoughts,' 'soul,' 'spirit,' 'culture,' and 'ideas' usually observed in the form of signs and symbols (which must be considered as real entities or objects) are regarded as inextricably interwoven with all the other components of a region, and are to be studied in the same way."*[22]

Lundberg's attempts to apply his preconceived techniques to these data, however, do not indicate that they can be studied in the same way as all the other components of a region. For example, the idea that the relationship between the death of martyrs and the adoption of the martyrs' ideas, subsequently, in a given region is an ecological one comparable to the relationship of the death of "a sufficient number of organisms" in a given region to the subsequent success of other members of the same species can hardly be expected to bear any scientific fruit.[23] Furthermore, "nonmetricized diagrams" and "topological constructs" may indicate or illustrate concepts of movements and positions in social space,[24] but come no nearer the measurement of the "dimensions of society" taken objectively in any region than Chapin's illustrative diagrams, many of which are repeated; and the idea that such quasi-mathematical constructs as found in Chapin's *Contemporary American Institutions* are measures of the subjective aspects of persons, institutions, and communities demands divesting the process of quantification of the last remnants of its meaning.

As Robert F. Winch observes:

> To take a commonly used term, such as "social status" or "morale," and to define it in algebraic symbols . . . is quite in conformity with the current vogue in sociology which calls itself "operationalism." The operationalist does not address himself to the problem of making his definitions conform with those generally used. . . . The crucial justification and reason for operationalism, we are told by one of its most articulate and energetic proponents, is to be able to learn something about processes or relations not otherwise discoverable. . . .

[21] *Ibid.*, pp. 494-495, for Lundberg's example from A. J. Lotka.

[22] *Ibid.*, pp. 473-474.

[23] *Ibid.*, p. 478; cf. W. C. Allee, *Animal Aggregations* (Chicago, 1931), p. 354.

[24] George Devereux recognizes the inadequacy of his operational concepts of space and position to designate all human relationships when he says, "If the relation is 'loves' (rather than one involving position or comparison), the resulting proposition is not necessarily transitive and asymmetrical and may not indicate 'order' " (*American Journal of Sociology*, XLV, 1940, 690).

To the best of this writer's judgment (Professor Zeleny, in his articles on "Sociometry of Morale"[25] and "Measurement of Social Status"[26]) has shown only that subjects will fill out forms and register differential feelings toward other subjects—hardly "man bites dog" stuff.[27]

The appositive phrase ending the sentence above is equally applicable to the results obtainable by following the techniques of *Foundations of Sociology*.

V. THE SECOND INADEQUACY OF OPERATIONALISM: NOT FRUITFUL IN INSIGHT

The operationalists contend that they do not question the importance of insight in scientific endeavor; and they properly hold "that insight and understanding are the ends at which all scientific methods aim, rather than methods in themselves."[28] Since they are convinced that scientific insight cannot be gained by "wearing one's collar backwards," gazing into crystals, or going into trances,[29] they set about making "an objective description of the technic" which will yield fruitful insights. "Quantitative technics," says Lundberg, "are merely the more refined, easily used tools by which we gain insight and understanding."[30] And it is these "more refined technics" that he promises to give.

It is hard, however, to find anything in the method as applied by Lundberg, as someone has said, but "the painful elaboration of the obvious." And that is not new. Chapin's diagrams to which he refers have communicative value, but they did not give Chapin his insights; he had the insights before he drew the nonmetricized figures. Again, the author of *Foundations of Sociology* is high in his praise of Burgess and Cottrell's work, *Predicting Success or Failure in Marriage*;[31] but, after reading *Foundations*, it is with some surprise that one finds the author of that work speaking of the book on marriage "as a bench mark of competent research in sociology." As a matter of fact, the authors of the latter work do not seem to believe they have used the methods of the former; and they specifically do not recommend such methods. The

[25] *American Sociological Review*, VI (1939), 799-808.
[26] *American Journal of Sociology*, XLV (1940), 576-582.
[27] A Letter to the Editor, *American Journal of Sociology*, XLV (1940), 774.
[28] Lundberg, *op. cit.*, p. 51.
[29] *Ibid.*, p. 52.
[30] *Ibid.*, p. 51.
[31] Ernest W. Burgess and Leonard S. Cottrell, Jr., *Predicting Failure or Success in Marriage* (New York, 1939), reviewed by Lundberg in *American Journal of Sociology*, XLV (1940), 805-807.

two conclusions "relevant to further research in the field of human relations," conclusions which Burgess and Cottrell believe emerge from their study, do not point in the direction of operationalism. They write:

> Further research in the understanding of human behavior and its prediction requires the setting up of projects which combine the viewpoints and the techniques of the biological, the psychological, and the social sciences. The conceptual systems and methods of any of these disciplines alone is [*sic*] inadequate because man's behavior in society is a resultant of the constant interplay of constitutional, psychogenetic, cultural, and social influences. Research that uses one method to the exclusion or partial representation of the others is likely to end in one-sided and limited conclusions. . . . The other main finding . . . is that the prediction of human behavior is likely to be imperfect and highly contingent unless it relies upon the methods and data both of statistics and of case study. Each method has its own values and limitations; the unique merit of their combined use is that they not only are supplementary and complementary but, when brought into working relation with each other, increase the efficiency of both methods. . . . As a result of careful case studies which reveal the processes of the action of persons in social situations, and as a result of the statistical analysis made possible by the accumulation of mass data, we are now able to formulate more searching hypotheses concerning the basic mechanisms and underlying factors in human conduct which, when they are sufficiently tested and verified, may be applied to other fields.[32]

In spite of the emphasis placed here on the necessity for case studies, *Foundations of Sociology* mentions case studies but once with the remark that "all statistics necessarily consist of cases and that therefore there can be no antithesis or mutual exclusiveness between the two methods."[33] But this use of the term *case studies* is obviously very different from the meaning that Burgess and Cottrell make of the term, and really begs the whole question; for a statistical case is only an instance and involves no account of process or development. Moreover, the verbal symbols which constitute a part of the statistical "cases" which the operationalists prize so highly, as these symbols appear in the works of Lang and Terman on marriage, as well as that of Burgess and Cottrell, show less than 20 per cent of all marriages studied less happy and from 60 to 70 per cent more happy than the average! It therefore takes something besides symbols and the external ends of responses to yield insight. It also takes insight to ask scientific questions, or to know what the answers mean when they come.

[32] Burgess and Cottrell, *op. cit.*, pp. 373-374.
[33] P. 49.

Finally, the pseudofunctionalism of *Foundations,* resting as it does upon the concept of "electron-proton aggregations" as the make-up of all systems whatsoever, can make no real use of "the viewpoints and techniques of the biological, the psychological, and the social sciences," nor can it grapple with the numerous social phenomena which cannot be understood without them. It must consider both "the behavior of a paper flying before the wind and of a man flying in fear from a pursuing crowd" equally observable by physicochemical methods; for it is in each case "the behavior of an object of specified characteristics reacting to a stimulus of specified characteristics within the specified field of force."[34] But, contrary to Lundberg's criticism of MacIver's original statement that "the paper knows no fear and the wind no hate, but without fear and hate the man would not fly nor the crowd pursue,"[35] MacIver does not regard the words *fear* and *hate* as "essential components" of the situation. The words *fear* and *hate* do symbolize, however, essential components of the situation with which "operational" methods cannot deal; and, as Sorokin holds: "One word, 'fear,' gives to all of us a much better, fuller, and more precise knowledge of the phenomenon designated by the term than the whole 'deaf-mute' definition given above."[36] And he might have added that those who use the word *fear* come no nearer considering it a component of the situation than Lundberg does his own terms.

It is this "deaf-mute" quality of physicochemical or pseudofunctionalism among "operationalists" which makes it so inadequate in yielding scientific insight.

VI. THE THIRD INADEQUACY OF OPERATIONALISM: NOT FRUITFUL OF KNOWLEDGE APPLICABLE TO PROBLEMS OF SOCIAL CONTROL

We may let the author of *Foundations of Sociology* state a principle by which we may measure the validity of operationalism:

> The test of the adequacy . . . of any system at any given time will in any event be determined by certain empirical tests, notably whether the system affords a rationale of the adjustments that have to be made and whether it aids in planning those adjustments. The vogue of "physical" science today springs from just such demonstrable relevance in an industrial, mechanical age in which adjustments to remote environments have become necessary through

[34] *Ibid.,* pp. 12-14.
[35] R. M. MacIver, *Society: Its Structure and Changes* (New York, 1931), p. 530.
[36] In the review cited above, p. 797.

highly developed means of communication. The same conditions have, of course, forced the social sciences in the same direction and will, ultimately, I think, compel them to align themselves, completely with the "physical." But . . . the "truth," the merits, or advantages of this point of view will have to be determined by the same practical usefulness which has given modern science in other fields its prestige and its following as against the thoughtways it has supplanted.[37]

But when Lundberg, for example, actually attempts a sociological investigation in which he seeks insights that might be applied, he makes little use of the operational method. As a matter of fact, there is scarcely anything in his study of Westchester County, New York, entitled *Leisure: A Suburban Study*,[38] to suggest his physical science ideal.

The inadequacies of this ideal for yielding knowledge applicable to problems of control will be shown further in the discussion of the advantages of functionalism.

VII. THE NEOFUNCTIONAL TREND IS MORE PRONOUNCED

The predominating trend in sociology and in social psychology during the decade has been in the direction of an extension of functionalism as modified by various "dynamic" theories rather than in the direction of employing physical science methods. Hence we might say that the more pronounced trend has been toward neofunctionalism.

Shortly after Ogburn delivered his address on sociological folkways, Clarence Marsh Case wrote an article entitled "Toward a Gestalt Sociology," in which he predicted this neofunctional trend. Gestalt sociology, he said:

. . . will bear in mind the essentially symbolic and abstract reality of the formulation of even the most exact sciences. Mechanistic determinism will not remain a sacred tenet of its philosophy, and it will have room for the surprising freshness of conception that characterizes the theories of emergent evolution. As corollary to this, gestalt sociology will set out boldly to describe and explain the life of human culture groups as presenting a new and autonomous level of phenomena. In so doing it will avoid the abstracting fictions of behaviorism and endeavor to grasp the total situation, the complete configuration of human society. Using where helpful the spatial concepts and measurements of physical science and human ecology, it will go above and beyond them into the study of experience in the subjective conscious sense of meaning and values.

[37] Pp. 28-29.

[38] G. A. Lundberg, Mirra Komarovsky, and Mary Alice McInerny, *Leisure: A Suburban Study* (New York, 1934).

What is lost in mathematical exactness will be more than made up for in sociological insight. There will be analysis in all its work, but still more of synthesis in the end.[39]

The greatest development of the Gestalt phase of the neofunctional trend has been in the field of social phychology. Kurt Lewin's treatises on *A Dynamic Theory of Personality* and *Topological Psychology,* Wheeler's *Principles of Mental Development,* Koffka's *Principles of Gestalt Psychology,* and J. F. Brown's *Psychology and the Social Order* have led the way with suggestions fruitful for that field. The latter has advanced closest to the sociological field with his mode of attack being "to take the common functional-sociological descriptions of nations, religious bodies, classes . . . and order them to the language of constructs, in the hope of arriving at necessary sociological relationships and laws."[40] Using the "functional-sociological classification as a starting point," he hopes, "with the assistance of a field theoretical approach . . . to gain insight into social-psychological problems."[41] And by using a method of presentation akin to common blackboard doodling, he presents the insights afforded him by his field-theoretical approach very well. His dogmatism, however, somewhat mars the work. His idea that "organismic theory is in much better agreement with contemporary physics than atomistic mechanism" hardly gives the comfort to Lundberg's pseudofunctionalism which the latter claims he can draw from Brown; but Brown probably too greatly minimizes the capacity of the person to initiate a process of change in any configuration or total situation of which he forms a part.

Needless to say, those who were already stressing the total-situational viewpoint prior to this decade have found no cause to desert it. Ellwood, recognizing the work of the Gestalt psychologists, says:

The gestaltists in psychology have taught us to regard personality as functioning wholes. The soundest tradition in sociology has long stood for the

[39] C. M. Case, "Toward a Gestalt Sociology," *Sociology and Social Research,* XV (1930), 13-27, 26-27; Sorokin has, as may be seen from *Social and Cultural Dynamics,* Vol. I, chap. i, criticized what he calls the causal-functional method and has substituted a "logico-meaningful method," which, as the writer sees it, is supplementary to the former method but does not replace it. Cf. H. H. Frost, Jr., "Functionalism in Anthropology and Sociology," *Sociology and Social Research,* XXIII (1938), 373 ff. For an outline of trends, see M. J. Vincent, "Current Trends in Sociology," *Sociology and Social Research,* XXIII (1938), 37 ff.

[40] J. F. Brown, *Psychology and the Social Order,* p. 121.

[41] *Loc. cit.*

same view in the functioning of groups. But to understand such a total situation, we must have a social scientific method which will provide for the co-ordination or synthesis of the results of different sciences as they bear upon the total situation.[42]

And MacIver, versed in the *Verstehen* sociology of Max Weber, stresses the fact that "every social phenomenon we single out for purposes of explanation proves to be but one aspect of a great interwoven system"[43] which owes the creation of its unity to experience and which can be comprehended only in terms of experience. Moreover, "the whole system is a moving equilibrium" in which "there is an incessant readjustment of every aspect to every other aspect"; to "understand the changing aspect . . . we must understand the changing whole."[44]

The moving equilibrium for MacIver is, however, very different from the Lundbergian concept of balance and change. He holds that

> Social, biological, and physical changes are taking place concurrently, in accordance with their respective laws, but the adjustment of them all to one another within a single system is a social process and is achieved through the synthetic principle of creative experience. . . . The important point is that the whole equilibrium depends upon the focal activity of the human mentality.[45]

MacIver's position is in keeping with that of Florian Znaniecki in his *Methods of Sociology* with its emphasis upon the reconstruction of cultural systems in the experience of the investigator; and it serves to unify in our thinking the viewpoints of writers and students such as Willard Waller, who stresses sympathetic insight, and John Dollard and Clifford Shaw, who place stress upon the life-history in social research. His concept of a moving equilibrium also gathers up various ideas of the sequence pattern of social change as this concept, stemming out of Thomas, has grown through the thinking of such men as C. A. Ellwood, Lowell J. Carr, and Stuart A. Queen.

MacIver, Znaniecki, and the Gestaltists quite surely lay the methodological foundations for the work of the neofunctionalists among the ethnologists; and so Tylor and Sapir before them. Reference to the studies of Margaret Mead and Ruth Benedict within the decade furnishes an immediate example. Otto Klineberg's *Race Differences* is a thorough application of the total-situational theory to the problem of race; and

[42] C. A. Ellwood, *Methods in Sociology*, p. 21.
[43] R. M. MacIver, *Society: Its Structure and Its Changes*, p. 527.
[44] *Loc. cit.* [45] *Ibid.*, p. 528.

Lynd and Lynd's *Middletown in Transition* is an excellent instance of a situational study; a study of MacIver's "moving equilibrium," with stress upon the human elements involved in the redistribution of the configuration. Carl C. Zimmerman's *Changing Community*[46] is a less well-conceived work, making use of the experiential as the unifying element in community configurations.

The development of this functional viewpoint up to the present is well demonstrated by a series of articles in the *American Journal of Sociology* for May, 1939. Florian Znaniecki,[47] Maurice Halbwachs,[48] R. S. Woodworth,[49] J. F. Brown,[50] Kurt Lewin,[51] Harry Stack Sullivan,[52] B. Malinowski,[53] and Louis Wirth,[54] as the contributors, all took the functional viewpoint.

In his article, Znaniecki holds that "human individuals and social groups do not exist as natural objects," but as "data of evaluative and active human experiences"; that "the group is not an association of concrete individuals but a synthesis of member roles"; that "member roles and groups are cultural products, systems of values, and activities regulated in accordance with definite historical patterns."

Halbwachs, after pointing out the individualistic faults of physiological and associationist psychologies, turns to collective psychology as the only nonindividualistic kind, which he views as having two parts: the general study of the characteristics and functioning of group thought and the collective psychologies of subgroups, nation, family, class, etc. With a minimum of emphasis upon the individual, like his French predecessors he holds that sociology is the study of the concrete, exterior, manifestations of group thoughts and sentiments, but he holds that the sociologist must "view social phenomena through the frame of reference of collective psychology." He affirms, furthermore, that "even in demographic studies populations are regarded in terms of states of collective consciousness."

[46] New York, 1938.

[47] "Social Groups as Products of Participating Individuals," pp. 799-811.

[48] "Individual Consciousness and Collective Mind," pp. 812-822.

[49] "Individual and Group Behavior," pp. 823-828.

[50] "Individual, Group and Social Field," pp. 858-867.

[51] "Field Theory and Experiment in Social Psychology," pp. 868-895; see also Ronald Lippitt, "Field Theory and Experiment in Social Psychology: Autocratic and Democratic Group Atmospheres," *American Journal of Sociology*, XLV (1939), 26-49.

[52] "A Note on Formulating the Relationship of the Individual and the Group," pp. 932-937.

[53] "The Group and the Individual in Functional Analysis," pp. 938-964.

[54] "Social Interaction: The Problem of the Individual and the Group," pp. 965-978.

R. S. Woodworth again stresses the fact that Floyd Allport's nominalism, applied to two boys carrying a log, has to "leave out the log," or the common aim or activity.

Malinowski says that "since functional sociology includes not merely the emotional and the biological aspects of mental processes but also man's biological reality, the bodily needs, the environmental influences, and the cultural reactions to them must be studied side by side."

The French school under Radcliffe-Brown, according to Malinowski, neglects the individual in a kind of functionalism that goes to an extreme opposite the individualism of Floyd Allport.[55] But since biological needs give rise to cultural instruments, both must be viewed as parts of a configuration.

In his critical editorial reviewing the contributions of the writers named above, Louis Wirth sums up the functional trend and its implications as follows:

> In its most external aspect, social life involves the distribution of the members of an aggregate in space. From this physical and superficial view of an aggregate, we may proceed in two directions to explore further significant aspects of social life by means of the techniques of the various specialized branches of social science that concern themselves with it. On the one hand, we can seek to discover what is true of such an aggregate by virtue of the fact that the constituent members are organisms of a certain sort, endowed with the impulses and organic traits characteristic of their species. On the other hand we can ascertain what is true of the members of such an aggregate by the virtue of the fact that they are in interaction with one another and in the process have built up what we call a culture. Thus we come to see the peculiar relevance of human ecology, biology, psychology, and social science in its various branches to the understanding of the social life of man. No single field of specialization can by itself be expected to reveal more than a highly segmental aspect of the total reality, but each can become more fertile than it would be in isolation by recognizing its own peculiar problems and interests and their relations with others.[56]

In closing his article Wirth remarks:

> It is a sign of scientific progress that the first step in the realistic analysis of the relations between the individual and the group—the transcending of the

[55] Floyd Allport again states his general position on the relation of individual to group in his article, "Rule and Custom as Individual Variations of Behavior Distributed upon a Continuum of Conformity" in this same issue (pp. 897 ff.).

[56] Louis Wirth, *op. cit.*, p. 967.

long established barriers between the various academically departmentalized fields of interests—is now in process of realization.[57]

In this respect Wirth differs from Harry Elmer Barnes, who believes that we are drifting into specialization "stern foremost."

VIII. FUNCTIONAL SOCIOLOGY YIELDS MORE ADEQUATE INSIGHTS FOR THE SOCIAL LEADER

We have agreed with Lundberg that the adequacy of any system or method depends upon whether it "affords a rationale of the adjustments that have to be made and whether it aids in planning those adjustments." But we cannot agree that an operational definition of situations that fails to distinguish physical and social factors either is or can be of any use to the social leader. As a matter of fact, the successful social leader has always depended upon his dramatic insight for guidance. Not even Hitler succeeds through sheer force. Yet he might if there were no differences between physical and social configurations.

Groups of every kind are made up of persons playing member roles in such a way that every *group* is like the *cast of a play* just as every *cast of a play* involves a group. In fact, the concept of personality is derived from the persona of the stage; and whether the family, the labor union, the directors of the corporation, the employer and the employee, the party and its leaders, the government and its opposition, the criminal and his victim, or the conference of diplomatists are in their respective natural situations, a drama is in process. Hence, the playwright, the social scientist, and the social leader all must participate in the life of the group in order to catch meaning on the wing in the conversation of human attitudes; in order to be able to predict what persons and groups will do next, if placed in certain situations, in the light of what is already going on. And what is going on is not simply on the outside of the actors, but roots in "the conception of the whole play" which each member of the group holds "so firmly in his mind";[58] it is an expression of "psychical activity," involving "mutual awareness." Therefore, only a sociology pre-eminently interested in "the way in which beings endowed with consciousness act in relation to one another"[59] can be of much serv-

[57] *Ibid.*, p. 978; cf. Wirth (ed.), *Eleven Twenty-six* (Chicago, 1940), "Round Table" on "The Social Sciences, One or Many," pp. 113-152.

[58] Quoted from Joseph Lee by Charles Horton Cooley, *Social Organization*, pp. 34-35.

[59] MacIver, *Society: Its Structure and Changes*, p. 43.

ice to the social leader. And since functional sociology is not psychologically blind, it not only supplies to the leader the requisite knowledge of other components in a given system but supplies the insights by which he may hold the "conception of the whole play" more clearly than the rest of his group and become able to interpret it more clearly to them, thus "breaking out the road ahead and giving confidence to the rest to follow."[60] But that social scientist who can make no operational difference between a man flying in fear from a crowd and a paper flying before the wind cannot help the leader very much.

IV. ONLY A FUNCTIONAL OR SYNTHETIC SOCIOLOGY IS ADEQUATE TO GIVE INSIGHT INTO THE MAJOR PROBLEMS OF SOCIAL CONTROL

One trend of the last decade has been the growing emphasis upon the development of a sociology that can be applied. Of the twenty-three sociologists who took part in the symposium on "Questions for Sociology," which appeared in *Social Forces* for December, 1934, no more than three were lacking in enthusiasm for sociology useful in social reconstruction. Only F. H. Hankins puts us in the position of being able to see where we are likely to go and why we are likely to go there without either the ability to choose our course or to steer ourselves toward it, if we could make a choice.

Among the large majority who believed that sociology should take a hand in the problems of society were C. A. Ellwood and H. E. Jensen, who held that the first need of sociology, if it is to share in social reconstruction, is to put more emphasis upon interpretation. Since the social sciences cannot apply themselves but must be applied in our society by the masses of the people, the masses of the people need such interpretation. Hence, the cry set up a few years ago, "more investigation and less interpretation" should be changed to "investigation and interpretation."

> The second great need of sociology, if it is to be applied in general social reconstruction, is to take more account of psychological and subjective factors in human relations. It is these psychological, subjective factors which are actually determining human relations and social behavior. We mean such factors as tradition, beliefs, values, and attitudes. . . . The masses must be taught to see that their troubles have come from wrong traditions, wrong beliefs, wrong values, and wrong attitudes; and that the remedy for the evils of our social life lies in right traditions, right beliefs, right attitudes. And such traditions must be based upon the scientific work of sociologists whose program of

[60] See Cooley, *loc. cit.*

research is comprehensive enough to include all the factors, objective and subjective, material and spiritual, that condition human association.[61]

As we have seen, only a functional or synthetic sociology is broad enough to include all these factors; yet all of them are clearly at work in everyone of our major social problems and in every aspect of our society which becomes a problem or constitutes an agency of control.

The statistical specialist who is methodologically naïve or the pseudo-functional operationalist who is naively methodological and, of necessity, little else, cannot adequately grapple with problems of population, some of which are more amenable to the sort of treatment they propose than are any other social problems. For example, as we have seen, the spatial and statistical distribution of a population is not the only significant factor in a regional configuration. As J. O. Hertzler recently wrote:

> It may be said quite truthfully that the regionalists have not explained the social psychological aspects of their subject, and the social psychologists have not discovered the region as that a real unit which is so rapidly becoming a matter of general interest in social investigation, planning, and administration.[62]

The region, Hertzler contends, is a social psychological and a cultural phenomenon. As a cultural phenomenon, the "cultural landscape" overlying the natural landscape consists of the economic structure, varied composition of the population, "the effects of historical social processes—ecological, political, economic, social—which have occurred within the area," and a combination of imported cultures. As a psychological phenomenon, the region gives rise to sentiments, wishes, interests, loyalties, attitudes, thought patterns, habit system, and types of personality. And as such only a functional sociology can study it or make predictions about it—a sociology that is not psychologically blind and bereft of historical memory.

If one examines the concepts and problems brought to the fore in the symposium named above, he at once sees that a sociology thus blind and bereft is inadequate when applied to them:

Advertising, the analysis of social institutions and situations, attitudes —"rational" and "irrational," "right" and "wrong"—and plans to change

[61] *Social Forces,* XIII (1934), 187-188.

[62] J. O. Hertzler, "The Social Psychology of Regionalism," *Social Forces,* XVIII (1940), 331; cf. Robert E. Park, "Symbiosis and Socialization: A Frame of Reference for the Study of Society," *American Journal of Sociology,* XLV (1939), 1-25.

attitudes require the application of a functional sociology. Likewise, gaining scientific insight in collective psychiatry, the development of collective psychology for social planning, freeing communication from the dominance of special interests, gaining co-operation in community organization, the promotion of creative leisure, and the understanding and control of crime demand the functional approach.

Educational goals, problems of and the social psychology of the family, goals to be desired in personality organization, goals for social planning, and social goals in general; group work, problems of housing, "humanitarian idealism," forestalling increases in human misery, the "reconstruction of ill-functioning social organization," and the avoidance of industrial civil war; the integration of conflict, marriage and morals—all these problems of applied sociology enumerated by the participants in the symposium—require a social interpretation based upon a synthesis of information growing out of the biological and all the social sciences.

The same thing can be said of the remaining problems they mentioned, only a few of which we can enumerate; but an alphabetized list such as is being given brings up problems of planned agricultural production, the popularization of sociological thought, poverty, prediction of the consequences of proposed courses of action, the prediction of success in marriage, preventive social work, propaganda, the integration of collective purpose, race conflict, recidivism, social religion, relief, and a "sick capitalist society" to which a carefully scientific sociologist refers—problems which would certainly task the social scientist determined to stay within the range permitted by operational definitions.

To continue, social case analysis, prediction of the rate of social change, crisis as it stimulates social research, "social debacles," the study of social events to facilitate social diagnosis, the development of "a sound social philosophy," the choice of values for social planning, the organization of a social science commission to plan social legislation, the education of people to see and master social situations, making the sociologist into a social strategist, and defining and developing social theory through the application of sociology would do the same thing.

Likewise, any one of the twelve problems advanced as of utmost importance by Robert S. Lynd in *Knowledge for What?*[63] requires for its solution the insights of functional sociology. The truth of this state-

[63] See the final chapter.

ment can be observed by examining the brief statement of these problems which follows.

To begin, (1) the disjointedness of our institutional life raises the question of whether we should extend "planning control to many areas now left to casual individual initiative." (2) The tendency in our society to use "undemocratic means" to achieve democratic ends seems to require the extension of democracy into industry and all other areas of social organization if we are to preserve democracy at all. (3) We need to know "what kind of culture" that culture would be "which would use its full array of knowledge and productive resources to maximize the quantity, quality, and useful variety of daily living for the masses of the American people." (4) Our present social science "plays down" our class antagonism in spite of the fact that "class lines are stiffening in the United States." We need to understand and reverse the process. (5) In our culture we pay lip service to an equality which does not exist. We must restructure our culture "so as to take care for (our) inequalities." (6) Being irrational, we assume that we are highly rational. "What kind of culture would it be which would not expect those who live by it to improvise rational solutions for its own irrational disjunctions?" (7) Social science is responsible for the discovery of points at which "fundamental changes in the cultural structures are needed" and for blueprinting "the ways of achieving them," rather than leaving "the wayside open to all manner of agencies, commercial and otherwise, to install whatever habits they find convenient." (8) Religion must not be avoided by the social scientist; for "it is the responsibility of a science that recognizes human values as a part of its data to help search out the content and mode of durable loyalties. . . . What kind of American culture would it be which would set out to build creative common purposes, *not* imposed by Fascist class interest, but built upon humanly rich cravings in all the people?" (9) Is there not a need to develop a culture that will play down the need for and the possibilities of war? (10) In our urban civilization do we not need to develop through the co-operative work of many specialists programs of city planning? (11) What can we do about the resistance offered to these and all other needed social changes? (12) Lastly, we need a science free and unhampered by social restraints in the discovery of truth.[64]

[64] *Ibid.*, chap. vi, contains the twelve "outrageous hypotheses" listed above. See A. R. Hatton's estimate of Lynd's work in Louis Wirth (ed.), *Eleven Twenty-six*, pp. 145-147.

To grapple with these problems will require a science free from both social and methodological restraints in the discovery of truth. Sorokin has shown that fluctuations in the cultural mentality have a tendency to carry science along with them. Hence, science at one and the same time is likely to suffer from both social and methodological injurious restraints. For in a sensate culture, for example, the focus is on the physical aspects of reality, the stress is upon physical science, and even the social sciences are likely to be viewed in terms of the physical. Likewise, values are relative to sensate desires, and science concerns itself only with the means for the satisfaction of such desires as prevail when it is applied. But the trends are in the direction of freedom in the thoughtways of American social scientists; and also toward the recognition of values.

As to the trend in the direction of freedom in the thoughtways, it may be said that the "folkways" of the physical science tradition are proving too rigid to be scientific in the social sciences and, like the folkways in general, too uncritically accepted and applied by those fearful of philosophy to become the universal thoughtways of American social scientists who, for the most part, have less fear of the intellectual.

As to the trend toward the recognition of values, we may recall the statement of Panunzio, partially quoted from William Morris Davis:

> If science is to subserve human needs, it will continue to discover and catalogue "all the islands of the universe 300,000,000 or more light years distant," but it will not fiddle while Rome burns; it will not "continue to work upon our recondite, nonhuman problems, while our neighbors suffer and our nation is criminally demoralized."[65]

Or we may even cite Lundberg when he is not absorbed in the subject of method. For in their Preface to *Leisure,* he and his collaborators say:

> We have taken the liberty of including not only the facts, but conclusions which follow from *thought* about the facts in relation to existing standards and evaluations. In this respect our attitude has been admirably summarized in a recent statement . . . by Charles A. Beard:
>
> "Science can discover the facts that condition realization and furnish instrumentalities for carrying plan and purpose into effect. Science without dreams is sterile. Dreams without research and science are empty. The deed of ignorance is perilous; deedless information is futile. United, idea and deed may create a civilization. A revolution in thought is at hand, a revolution as significant as the Renaissance: the subjection of science to ethical and esthetic

[65] Constantine Panunzio, *Major Social Institutions* (New York, 1939), p. 338; cf. William Morris Davis, "Faith of Reverent Science," *Scientific Monthly,* XXXVIII (1934), 417.

purpose. Hence the next great survey undertaken in the name of the social sciences may begin boldly with a statement of values agreed upon, and then utilize science to discover the conditions, limitations, inventions, and methods involved in realization."[66]

Only one suggestion remains to be made: since the values to be agreed upon will surely fall within the limits of the socially possible and the socially conducive to survival, development, and harmony,[67] the social sciences themselves must surely furnish the data for the formulation of the values with the statement of which our future researches may boldly begin.[68]

[66] Lundberg, Komarovsky, and McInerny, *op. cit.*, p. v-vi; see the quotation from Charles A. Beard in *Social Forces*, XI (1933), 510.

[67] C. A. Ellwood, *Methods in Sociology*, chap. ix.

[68] Fortunately the writer has just received the second volume of the "Duke University Sociological Series," Joseph Mayer's *Social Science Principles in the Light of Scientific Method* (Durham, 1941), in which the author stresses the value aspect of social research. He says that he does not wish for a moment to "underestimate the importance of statistical and other modern methods for more properly accumulating and evaluating [social] data," but he nevertheless "believes that all such endeavor, important as it is, is in the nature of a preliminary taxonomic procedure, much as the Linnean classification in biology was preliminary to the more adequate classifications which later developed in the light of the evolutionary hypothesis" (pp. 10-11).

Mayer bases this belief on two hypotheses: "first, that a reasonably accurate understanding of biological and psychological potentialities and desires is needed before the norm or norms toward which man may build his society can be satisfactorily formulated; and, second, that society, unlike other basic factors around which sciences have been built, is itself so largely man-made that it is in good part within man's power to reshape, rebuild, revise, or change by deliberate effort its institutional framework. If these two hypotheses are justified," he continues, "it would seem ultimately necessary that the potentialities and desires of human beings, and the ethical ideals around which man may build his society, must be reasonably explicit before any really scientific measures of social change or social control can be formulated" *(loc. cit.)*.

The present writer agrees; and he stresses the fact that such values can be made explicit only in the light of foundation researches in the social sciences integrating the data of biology, psychology, history, and culture. There is no other way to discover "the potentialities and desires," the fundamental needs of human beings and "the ethical ideals around which man may build his society." Then, on top of this foundation may be built many of our future researches. (See also Part IV of Mayer's *Social Science Principles*, in which he discusses "Broader Value Concepts" with special relevance to their implications for economics.)

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